1967

COUGAR
FAIRLANE
FALCON
MERCURY
INTERMEDIATE
MUSTANG
SHOP MANUAL

1967 Cougar, Fairlane, Falcon, Mercury and Mustang Shop Manual
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1967

COUGAR FAIRLANE FALCON MERCURY-INTERMEDIATE MUSTANG

Ford SERVICE PUBLICATIONS

FIRST PRINTING—MARCH, 1967

GROUP INDEX

SPECIFICATIONS AND SPECIAL SERVICE TOOLS AT END OF EACH GROUP

FOREWORD

This shop manual provides the Service Technician with information for the proper servicing of the 1967 Cougar, Fairlane, Falcon, Mercury Intermediate , Comet and Mustang cars.

The maintenance schedule and procedures for maintenance operations are published in the 1967 Passenger Car Maintenance and Lubrication Manual.

The information in this manual is grouped according to the type of work being performed, such as diagnosis and testing, frequently performed adjustments and repairs, in-vehicle adjustments, overhaul, etc. Specifications and recommended special tools are included.

Refer to the opposite page for important vehicle identification data.

The descriptions and specifications in this manual were in effect at the time this manual was approved for printing. The Ford Motor Company reserves the right to discontinue models at any time, or change specifications or design, without notice and without incurring obligation.

Ford SERVICE PUBLICATIONS

Vehicle Identification

GROUP 1

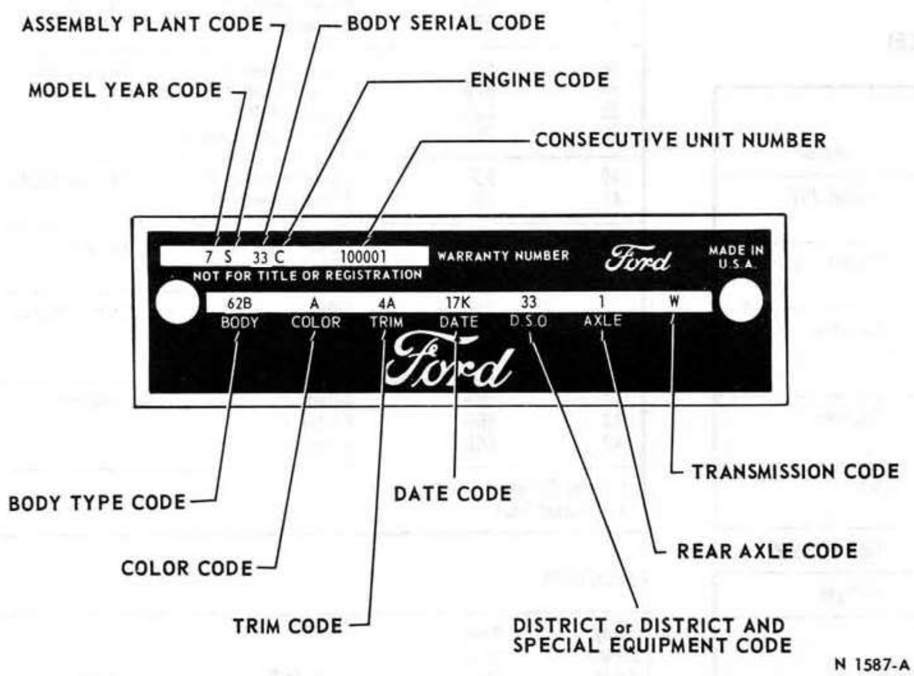


FIG. 1—Typical Warranty Plate—Fairlane Shown

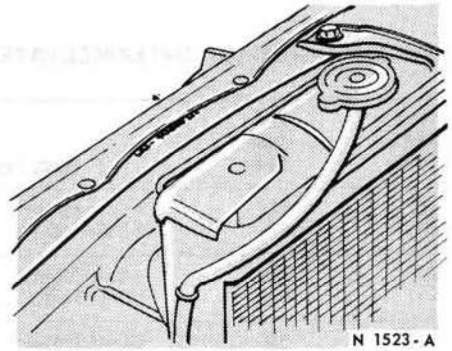


FIG. 2—Mercury, Comet (Intermediate- Size) Identification Number Location

FIG. 3—Cougar Identification Number Location

FIG. 4—Mustang Identification Number Location

VEHICLE WARRANTY NUMBER

The vehicle warranty number is the first line of numbers and letters appearing on the Warranty Plate (Fig. 1). The first number indicates the model year. The letter following the model year number indicates the manufacturing assembly plant. The next two numbers designate the Body Serial Code followed by a letter expressing the Engine Code. The group of six digits remaining on the first line indicate the Consecutive Unit Number.

VEHICLE DATA

The vehicle data appears on the second or lower line on the Warranty Plate. The first two numbers and a letter identify the Body Style. A letter or a number appears next indicating the Exterior Paint Color followed by a number-letter combination designating the Interior Trim. To the right of this code appears the Date Code indicating the date the car was manufactured. A two-digit number next designates the district in which the car was ordered and may appear in conjunction with a Domestic Special Order or Foreign Special Order number when applicable. The final two spaces indicate the Rear Axle Ratio (numbers for regular axles, letters for locking-types) and the Transmission type (numbers for manual, letters for automatic).

OFFICIAL VEHICLE IDENTIFICATION NUMBERS

The official Vehicle identification Numbers for titles and registration purposes are stamped in the following locations:

Mercury, Comet (Intermediate-size), Fairlane, Falcon – On the top surface of the radiator and front fender apron support (near the radiator fill cap) Fig. 2.

Cougar – On the top upper flange of the left front fender apron (Fig. 3).

MUSTANG – On the top upper flange of the left front fender apron (Fig. 4).

MODEL YEAR CODE

The number 7 designates 1967.

BODY SERIAL AND STYLE CODES

The two-digit numeral which follows the assembly plant code identifies the body series. This two-digit number is used in conjunction with the Body Style Code, in the Vehicle Date, which consists of a two-digit number with a letter suffix. The following chart lists the Body Serial Codes, Body Style Codes and the model.

MERCURY—COMET (INTERMEDIATE—SIZE)

Body Serial Code	Body Style Code	Body Type	Model
02	54A	4-Door Sedan ①	Comet 202
01	62A	2-Door Sedan ①	
08	54B	4-Door Sedan ①	Comet Capri
07	63B	2-Door Hardtop ①	
10	54D	4-Door Sedan ①	Caliente
11	63D	2-Door Hardtop ①	
12	76D	2-Door Convertible	
15	63E	2-Door Hardtop ②	Cyclone
16	76C	2-Door Convertible ②	
17	63H	2-Door Hardtop ②	GT
18	76H	2-Door Convertible ②	
03	71A	4-Door 6 Passenger	Comet Voyager
08	71C	4-Door 6 Passenger	Villager

Bench Seat
Bucket Seat

COUGAR

Body Serial Code	Body Style Code	Body Type
91	65A	2-door Hardtop (Bucket Seat)
91	65B	2-Door Hardtop (Bucket Seat) ①
91	65D	2-Door Hardtop (Bench Seat) ①
91	65C	2-Door Hardtop (Bench Seat)

① Luxury Model

MUSTANG

Body Serial Code	Body Style Code	Body Type
02	63A	2-Door Fastback ①
01	65A	2-Door Hardtop ①
03	76A	2-Door Convertible ①
02	63B	2-Door Fastback ① ③
01	65B	2-Door Hardtop ① ③
03	76B	2-Door Convertible ① ③
01	65C	2-Door Hardtop ②
03	76C	2-Door Convertible ②

① Bucket Seat
② Bench Seat
③ Luxury Model

BODY SERIAL AND STYLE CODES—(continued)

FAIRLANE

Body Serial Code	Body Style Code	Body Type	Model
31	54A	4-Door Sedan ①	Fairlane
30	62A	2-Door Sedan ①	
34	54B	4-Door Sedan ①	Fairlane 500
33	62B	2-Door Sedan ①	
35	63B	2-Door Hardtop ①	
36	76B	2-Door Convertible ①	
40	63C	2-Door Hardtop ②	Fairlane 500XL
41	76C	2-Door Convertible ②	
42	63D	2-Door Hardtop ②	Fairlane 500GT
43	76D	2-Door Convertible ②	
32	71D	4-Door	Station Wagon
37	71B	4-Door	
38	71E	4-Door	
47	66A	2-Door ①	Ranchero
48	66B	2-Door ①	
49	66D	2-Door ②	

① Bench Seat
② Bucket Seat

FALCON

Body Serial Code	Body Style Code	Body Type	Model
10	62A	2-Door Club Coupe ①	Standard
11	54A	4-Door Sedan ①	
20	62B	2-Door Club Coupe ①	Futura
21	54B	4-Door Sedan ①	
22	62C	2-Door ②	Sport Coupe
12	71A	4-Door	Wagon (Std.)
23	71B	4-Door	Wagon (Deluxe)

① Bench Seat
② Bucket Seat

CONSECUTIVE UNIT NUMBER

Each model year, each assembly plant begins production with number 500001 (Mercury, Comet or Cougar) or 100001 (Fairlane, Falcon, Mustang) and continues on for each unit built.

ENGINE CODES

Code	Type
U	6 Cyl. 170 Cu. In. (1V)
T	6 Cyl. 200 Cu. In. (1V)
2	6 Cyl. ① 200 Cu. In. (1V)
C	8 Cyl. 289 Cu. In. (2V)
3	8 Cyl. ① 289 Cu. In. (2V)
A	8 Cyl. 289 Cu. In. (4V) Prem. Fuel
K	8 Cyl. 289 Cu. In. (4V) Hi-Perf.
Y	8 Cyl. 390 Cu. In. (2V)
H	8 Cyl. 390 Cu. In. (2V)
S	8 Cyl. 390 Cu. In. (4V)
W	8 Cyl. 427 Cu. In. (4V) Hi-Perf.
R	8 Cyl. 427 Cu. In. (8V) Hi-Perf.

① Low Compression

TRANSMISSION CODES

Code	Type
1	3-Speed Manual
2	Overdrive
3	3-Speed Manual
5	4-Speed Manual
W	Automatic (C4)
U	Automatic (C6)

REAR AXLE RATIO CODES

A number designates a conventional axle, while a letter designates a locking differential

Code	Ratio	Code	Ratio
1	3.00:1	A	3.00:1
2	2.83:1		
3	3.20:1	C	3.20:1
4	3.25:1	D	3.25:1
5	3.50:1	E	3.50:1
6	2.80:1		

DATE CODES

A number signifying the date precedes the month code letter. A second-year code letter will be used if the model exceeds 12 months.

Month	Code First Year	Code Second Year
January	A	N
February	B	P
March	C	Q
April	D	R
May	E	S
June	F	T
July	G	U
August	H	V
September	J	W
October	K	X
November	L	Y
December	M	Z

ASSEMBLY PLANT CODES

Code Letter		Code Letter	
A	Atlanta	L	Michigan Truck
B	Oakville (Canada)	N	Norfolk
C	Ontario Truck	P	Twin Cities
D	Dallas	R	San Jose
E	Mahwah	S	Pilot Plant
F	Dearborn	T	Metuchen
G	Chicago	U	Louisville
H	Lorain	W	Wayne
J	Los Angeles	Y	Wixom
K	Kansas City	Z	St. Louis

DISTRICT CODES (DSO)

Units built on a Domestic Special Order, Foreign Special Order, or other special orders will have the complete order number in this space. Also to appear in this space is the two-digit code number of the District which ordered the unit. If the unit is a regular production unit, only the District code number will appear.

FORD

Code	District
11	Boston
13	New York
15	Newark
16	Philadelphia
17	Washington
21	Atlanta
22	Charlotte
24	Jacksonville
25	Richmond
27	Cincinnati
28	Louisville
32	Cleveland
33	Detroit
34	Indianapolis
35	Lansing
37	Buffalo
38	Pittsburgh
41	Chicago
42	Fargo
43	Milwaukee
44	Twin Cities
45	Davenport
51	Denver
52	Des Moines
53	Kansas City
54	Omaha
55	St. Louis
61	Dallas
62	Houston
63	Memphis
64	New Orleans
65	Oklahoma City
71	Los Angeles
72	San Jose
73	Salt Lake City
74	Seattle
75	Phoenix
81	Ford of Canada
83	Government
84	Home Office Reserve
85	American Red Cross
89	Transportation Services
90-99	Export

MERCURY

Code	District	Code	District
11	Boston	34	Detroit
16	Philadelphia	41	Chicago
15	New York	42	St. Louis
17	Washington	46	Twin Cities
21	Atlanta	51	Denver
22	Dallas	52	Los Angeles
23	Jacksonville	53	Oakland
26	Memphis	54	Seattle
31	Buffalo	84	Home Office Reserve
32	Cincinnati		
33	Cleveland	90	Export

EXTERIOR PAINT COLOR CODES

Code	M-30-J M-32-J	Color
A	1724-A	Black
B	1734-A	Lt. Aqua
E	2045-A	Med. Beige Met.
I	2041-A	Lime Met.
K	1903-A	Dk. Blue Met.
M	1619-A	White
Q	1624-A	Med. Blue Met.
T	2008-A	Red
V	2066-A	Bronze Met.
W	1908-A	Med. Aqua Met.
X	1632-A	Maroon Met.
Y	2039-A	Dk. Green Met.
Z	1915-A	Med. Gold Met.
2	1633-A	Yellow
4	1901-A	Med. Gray Met.
6	1631-A	Lt. Beige
8	1955-A	Yellow

INTERIOR TRIM CODES

Code	Trim Schemes
1B	Blue Cloth and Blue Vinyl
1D	Red Cloth and Red Vinyl
1K	Aqua Cloth and Aqua Vinyl
1U	Parchment Cloth and Parchment Vinyl W/Black
2A	Black Vinyl
2B	Blue Vinyl
2D	Red Vinyl
2F	Saddle Vinyl
2G	Ivy Gold Vinyl
2K	Aqua Vinyl
2U	Parchment Vinyl W/Black
3B	Blue Cloth and Blue Vinyl
3G	Ivy Gold Cloth and Ivy Gold Vinyl
3K	Aqua Cloth and Aqua Vinyl
3U	Parchment Cloth and Parchment Vinyl W/Black
4A	Black Vinyl
4B	Blue Vinyl
4D	Red Vinyl
4G	Ivy Gold Vinyl
4K	Aqua Vinyl
4U	Parchment Vinyl
5A	Black Cloth and Black Vinyl
5B	Dark Blue Cloth and Blue Vinyl
5K	Aqua Cloth and Aqua Vinyl
5U	Parchment Cloth and Parchment Vinyl W/Saddle
6A	Black Vinyl
6B	Dark Blue Vinyl
6D	Red Vinyl
6F	Saddle Vinyl
6G	Dk. Ivy Gold Vinyl
6K	Aqua Vinyl
6U	Parchment Vinyl
7A	Black Vinyl
7B	Blue Vinyl
7U	Parchment Cloth and Parchment Vinyl
8A	Black Vinyl
8B	Blue Vinyl
8D	Red Vinyl
8F	Saddle Vinyl

INTERIOR TRIM CODES—(continued)

Code	Trim Schemes
8G	Ivy Gold Vinyl
8K	Aqua Vinyl
8U	Parchment Vinyl W/Black
9A	Black Cloth and Black Vinyl
9B	Dk. Blue Cloth and Dk. Blue Vinyl
9D	Dk. Red Cloth and Dk. Red Vinyl
9K	Aqua Cloth and Aqua Vinyl
9U	Parchment Cloth and Parchment Vinyl W/Black
FA	Parchment Vinyl W/Black
FB	Parchment Vinyl W/Blue
FD	Parchment Vinyl W/Red
FG	Parchment Vinyl W/Ivy Gold
FK	Parchment Vinyl W/Aqua
GA	Black Vinyl W/Parchment
GB	Blue Vinyl W/Parchment
GD	Red Vinyl W/Parchment
GG	Ivy Gold Vinyl W/Parchment
GF	Saddle Vinyl W/Parchment
GK	Aqua Vinyl W/Parchment
LB	Red Vinyl
LD	Blue Vinyl
LU	Parchment Cloth and Parchment Vinyl W/Black
OU	Parchment Vinyl
UA	Parchment Vinyl W/Black
UB	Parchment Vinyl W/Blue
UD	Parchment Vinyl W/Red
UF	Parchment Vinyl W/Saddle
UG	Parchment Vinyl W/Ivy Gold
UK	Parchment Vinyl W/Aqua

Brakes

GROUP 2

PART 2-1— *General Brake Service*

1 DIAGNOSIS AND TESTING

BRAKE SYSTEM TESTS

BRAKE FLUID LEVEL AND HYDRAULIC SYSTEM

1. Always check the fluid level in the brake master cylinder reservoirs before performing the test procedures. If the fluid level is not within 1/4 to 1/2 inch of the top of the master cylinder reservoirs, add the specified brake fluid. Add Rotunda Brake Fluid — Extra Heavy Duty — Part Number C6AZ-19542-A (ESA-M6C25-A) or equivalent for all disc brake applications and Rotunda Brake Fluid — Heavy Duty — Part Number B7AZ-19542-A, R-103-A or equivalent for power drum or standard drum applications. **The disc brake extra heavy duty brake fluid is colored blue for identification purposes. Do not mix low temperature brake fluids with the specified disc brake fluid.**

DUAL MASTER CYLINDER BRAKE SYSTEM

1. Turn the ignition switch to the ACC or ON position. If the light on the brake warning lamp remains on, the condition may be caused by a defective switch, grounded switch wires or the differential pressure valve is not centered. Centralize the differential pressure valve as outlined under Hydraulic System Bleeding and Centralizing of the Differential Valve in this section of the manual. If the warning light remains on, check the switch connector and wire for a grounded condition and repair or replace the wire assembly. If the condition of the wire is good, replace the brake warning lamp switch.

2. Turn the ignition switch to the start position. If the brake warning lamp does not light, check the light and wiring for defects and replace or repair wiring.

3. If the brake warning lamp does not light when a pressure differential condition exists in the brake system, the warning lamp may be burned out, the warning lamp switch is inoperative or the switch to lamp wiring has an open circuit. Check the bulb and replace it, if required. Check the switch to lamp wires for an open circuit and repair or replace them, if required. If the warning lamp still does not light, replace the switch.

BRAKE PEDAL FREE HEIGHT AND TRAVEL MEASUREMENTS

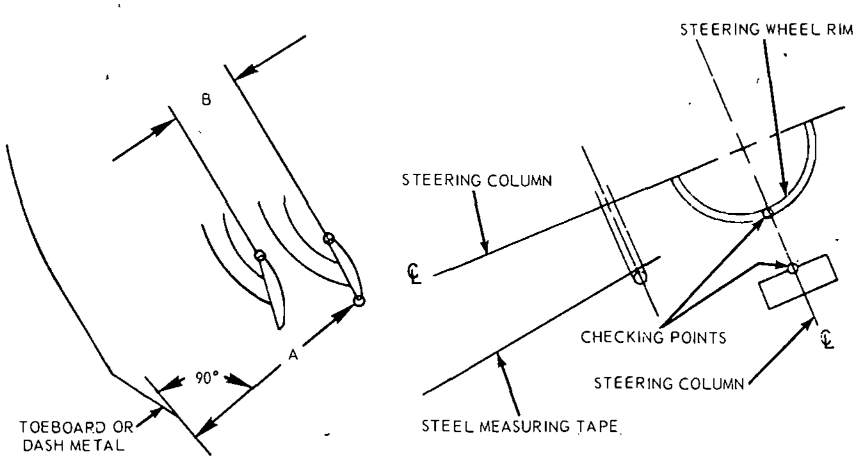
With the engine running for full power brake operation, measure the brake pedal free height, and check the brake pedal travel with the use of the Brake Pedal Pressure Gauge, Tool WRE-500-50 as follows:

Brake Pedal Free Height Measurement

1. Insert a slender, sharp pointed prod through the carpet and sound deadner to the dash panel metal and measure the distance to the brake pedal (Fig. 1).

2. If the position of the pedal is not within specification, check the brake pedal linkage for missing bushings or loose attaching bolts and replace them, if required.

3. If the pedal free height is still out of specification, check the brake pedal booster push rod (if so equipped) or master cylinder to be sure the correct parts are installed. Replace the defective parts as necessary.



VEHICLE	TYPE	PEDAL FREE HEIGHT A	PEDAL TRAVEL B
FALCON–COMET–FAIRLANE	NON-POWER DRUM	8.03 6.81	2.74
FALCON–COMET–FAIRLANE	POWER DRUM	5.04 3.74	1.82
FALCON–COMET–FAIRLANE	POWER DISC	6.39 4.90	2.08
FALCON–COMET–FAIRLANE	NON-POWER DISC	8.03 6.81	2.08
MUSTANG–COUGAR	NON-POWER DRUM	6.98 6.03	2.68
MUSTANG–COUGAR	POWER DRUM	5.61 4.60	1.82
MUSTANG–COUGAR	POWER DISC	5.61 4.60	1.82

NOTE: A DIMENSION TO BE MEASURED TO SHEET METAL
B DIMENSION TO BE MEASURED PARALLEL TO THE VERTICAL CENTERLINE OF THE STEERING COLUMN WITH A 50 POUND LOAD APPLIED TO THE CENTERLINE OF THE BRAKE PEDAL PAD. (CHECKS ON POWER BRAKE VEHICLES MADE WITH ENGINE RUNNING) H1551-A

FIG. 1—Brake Pedal Height and Travel Measurements

Tool–WRE-500-50

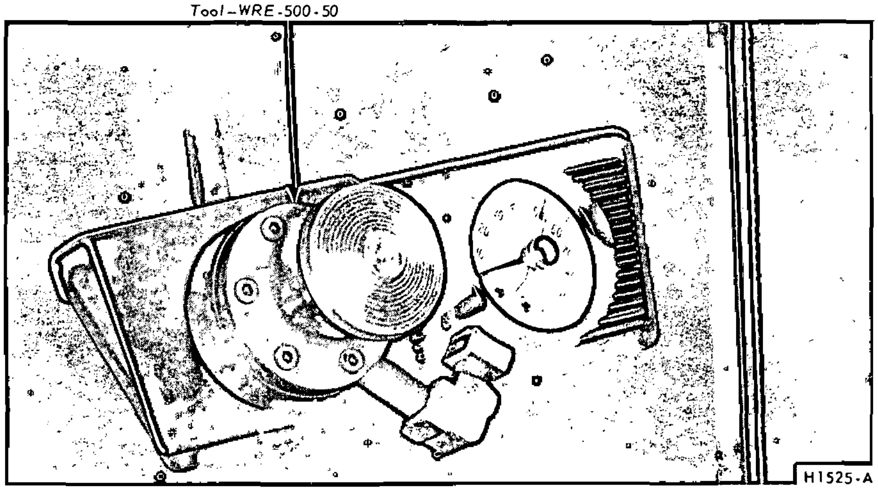


FIG. 2—Brake Pedal Effort Gauge Installed — Typical

Brake Pedal Travel Measurement

1. Install a Brake Pedal Pressure Gauge on the brake pedal pad (Fig. 2).

2. Hook a steel measuring tape to the brake pedal as shown in Fig. 1. Measure and record the distance from the brake pedal free height position to the reference point, which is at the six o'clock position on the steering wheel rim.

3. With the steel tape still hooked to the brake pedal depress the brake by pressing downward on the brake pedal effort gauge. Apply a 50 pound load to the center of the pedal by observing the pressure gauge, and measure the distance from the brake pedal to the fixed reference point on the steering wheel rim, parallel to the centerline of the steering column.

4. The difference between the brake pedal free height and the depressed pedal measurement under a 50 pound load should be within the specified maximum pedal travel service specification B in Fig. 1.

5. If the pedal travel is more than the specified maximum shown in Fig. 1, dimension B, make several sharp reverse stops (equivalent to 50 pounds pedal pressure) with a forward stop before each. Move the car in reverse and forward for a distance of approximately ten feet; then apply the brakes sharply and hold the brake pedal down until the car is completely stopped. This will actuate the brake self-adjusters. If these stops do not bring the brake pedal travel within specification, make several additional forward and reverse stops as outlined above.

6. If the second series of stops do not bring the brake pedal travel within specification, remove the brake drums and check the brake adjusters to make sure they are functioning. Check the brake linings for wear or damage. Repair or replace all worn or damaged parts and non-functioning adjusters. Adjust the brake lining outside diameter to the approximate inside diameter of the brake drum with Rotunda Tool HRE 8650 (Figs. 11 and 12, Part 2-2).

7. If all the brake adjusters, brake drums and linings are functional and the brake pedal travel is not within specifications, check the pedal linkage for missing bushings, or loose attachments. Bleed the brake and centralize the differential valve.

POWER BRAKE FUNCTIONAL TEST

1. With the transmission in neutral, stop the engine and apply the parking brake. Depress the brake pedal several times to exhaust all vacuum in the system.

2. With the engine shut off, depress the brake pedal and hold it in the applied position. If the pedal gradually falls away under this pressure, the hydraulic system is leaking. Check all tubing, hoses, calipers (if so equipped), wheel cylinders and connections for leaks.

If the brake pedal movement feels spongy, bleed the hydraulic system to remove air from the system. Refer to Hydraulic System Bleeding, Part 1, Section 2. Also, check for leaks or insufficient fluid.

3. With the engine shut off and all vacuum in the system exhausted, depress the pedal and hold it in the applied position. Start the engine. If the vacuum system is operating, the pedal will tend to fall away under foot pressure and less pressure will

be required to hold the pedal in the applied position. If no action is felt, the vacuum booster system is not functioning.

LOCKED WHEEL BRAKE

Should one of the wheel brakes be locked and the car must be moved, open the bleeder screw long enough to let out a few drops of brake fluid. **This bleeding operation will release the brakes but will not correct the cause of trouble.**

PARKING BRAKE

Visually check the operation of the parking brake linkage as the parking brake controls are moved to the applied position. Then, check the operation of the brake linkage when the parking brake controls are moved to the released position. These checks should indicate whether the manual parking brake control linkage is operating properly or requires repair or adjustment due to inability of the parking brake to hold against moderate vehicle movement.

ROAD TEST

A road test should only be conducted when the operator is sure the brakes will stop the vehicle.

During a road test, apply the vehicles brakes at a road speed of 20 mph for all problem conditions listed in Figs. 11 and 12 with the exception of those resolved in the Brake System Tests and brake chatter. To check for brake chatter or surge, apply the brakes lightly at 50 mph. For each of the symptoms encountered, check and eliminate the causes which are listed in Figs. 11 and 12.

If the road test reveals one or more problem conditions listed in Figs. 11 and 12, correct all malfunctions of the vacuum system, brake booster and hydraulic system prior to removing brake drums, brake calipers (if so equipped), brake shoes and linings or backing plates.

2 COMMON ADJUSTMENTS AND REPAIRS

PARKING BRAKE LINKAGE ADJUSTMENT

MUSTANG—COUGAR

Check the parking brake cables when the parking brakes are fully released. If the cables are loose, adjust them as follows:

1. Fully release the parking brake by turning the handle counterclockwise and pushing it inward.

2. Pull the parking brake handle outward to the third notch from its normal released position.

3. Raise the vehicle. Remove the wheel cover. Install Tool T66L-4204-L on the rear wheel (Fig. 3).

4. Turn the locking adjustment nut forward against the cable guide on the equalizer (Fig. 4) until there is 100 ft-lbs break-away torque at the rear wheel when turning the rear wheels in the direction of forward rotation with a torque wrench (Fig. 3). **The torque measurement must be made relative to the centerline of the wheel.**

5. Release the parking brake and make sure the brake shoes return to the fully released position and no drag is felt when turning the rear wheels.

6. Remove Tool T66L-4204-L. Install the wheel attaching bolts and torque them to specification. Install the wheel cover. Lower the vehicle.

COMET—FALCON—FAIRLANE

Check the parking brake cables when the brakes are fully released.

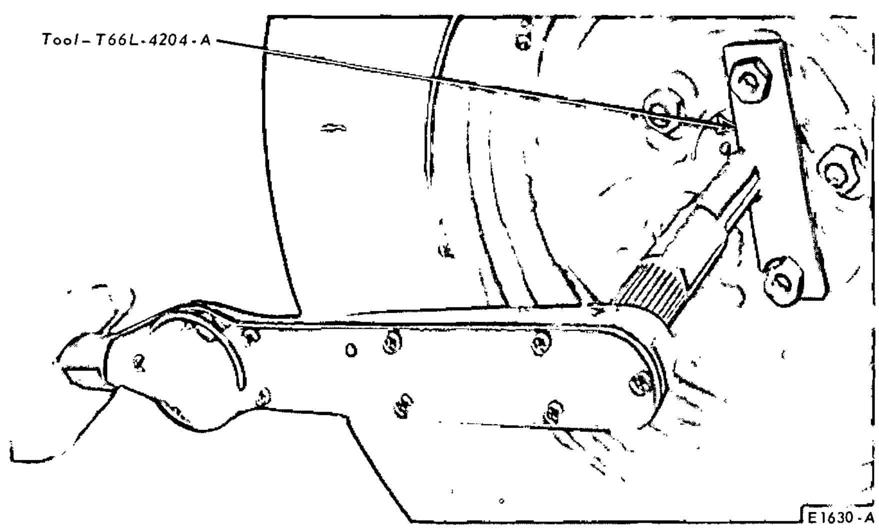


FIG. 3—Checking Parking Brake Break-Away Torque

If the cables are loose, adjust them as follows:

1. Fully release the parking brake pedal.

2. Raise the vehicle. Loosen the equalizer lock nut (Fig. 5) and turn the nut forward against the cable guide on the equalizer until there is 22 to 27 pounds tension on the left rear cable or there is 100 ft-lbs break-away torque when turning the rear wheels in the direction of forward rotation with a torque wrench and Tool T66L-4204-L as shown in Fig. 3. **The torque measurement must be made relative to the centerline of the wheel.** Tighten the lock nut.

3. Make sure there is no drag when turning the rear wheels.

4. Lower the vehicle. Remove the torque wrench and Tool T66L-4204-L, if required. Install the wheel attaching nuts and torque them to specification. Install the wheel cover.

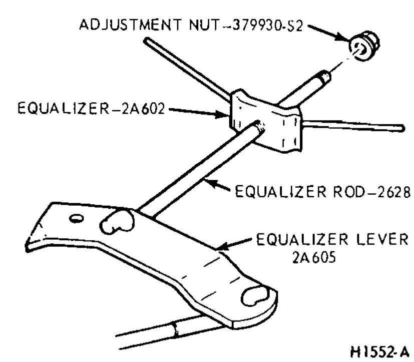


FIG. 4—Parking Brake Linkage Adjustment — Mustang and Cougar

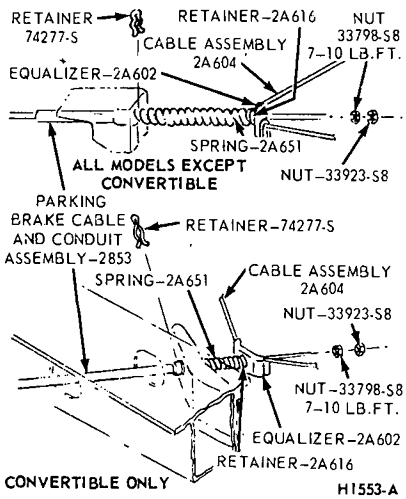


FIG. 5—Parking Brake Linkage Adjustment — Comet, Fairlane and Falcon

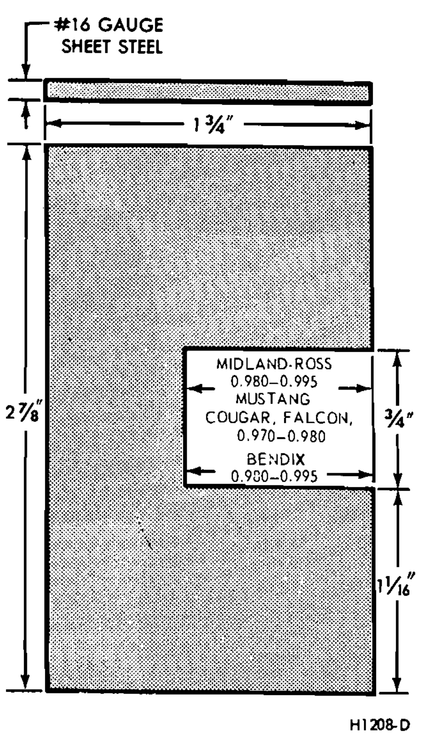


FIG. 6—Push Rod Gauge Dimensions

POWER BRAKE MASTER CYLINDER PUSH ROD ADJUSTMENT

The push rod is provided with an adjustment screw to maintain the correct relationship between the booster control valve plunger and the master cylinder pistons. Failure to maintain this relationship will prevent the master cylinder piston from completely releasing hydraulic pressure and can cause the brakes to drag, or cause excessive brake pedal travel.

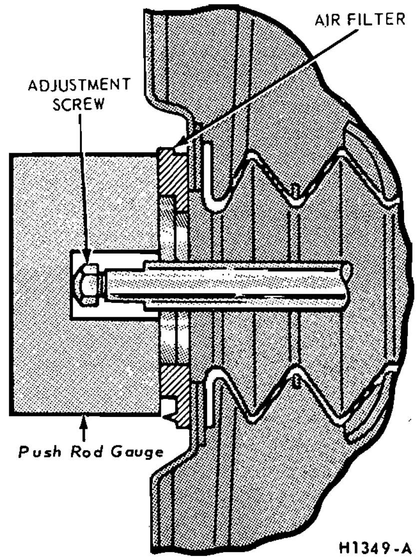


FIG. 7—Push Rod Adjustment — Midland-Ross

To check the adjustment of the screw, fabricate a gauge of the dimension shown in Fig. 6. Then place the gauge against the master cylinder mounting surface of the booster body as shown in Figs. 7 or 8. The push rod screw should be adjusted so that the end of the screw just touches the inner edge of the slot in the gauge. Do not set up side forces on the push rod. Side forces may break the valve plunger.

This is an approximate adjustment only. The push rod should not move more than 0.015 inch as it contacts the master cylinder piston. No movement (exact contact) is ideal.

HYDRAULIC SYSTEM BLEEDING AND CENTRALIZING OF THE DIFFERENTIAL VALVE

When any part of the hydraulic system has been disconnected for repair or replacement, air may enter the system and cause spongy pedal action. Bleed the hydraulic system after it has been properly connected, to be sure that all air is expelled.

MANUAL BLEEDING

The primary and secondary (front and rear) hydraulic brake systems are individual systems and are bled separately. Bleed the longest line first on the individual system being serviced. **During the complete bleeding operation, DO NOT allow the reservoir to run dry.** Keep the master cylinder reservoirs filled with Rotunda Fluid — Extra Heavy Duty — Part Number C6AZ-19542-A (ESA-M6C25-A). **The disc brake extra**

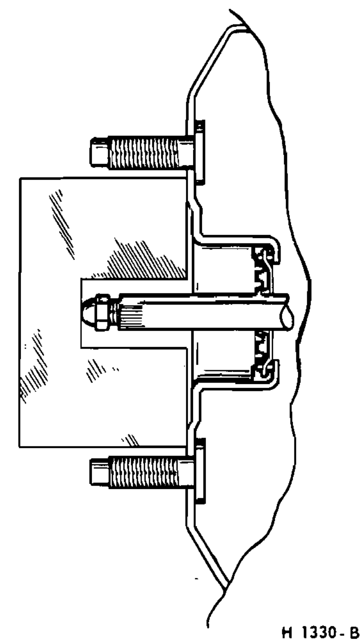


FIG. 8—Push-Rod Adjustment — Bendix

heavy duty brake fluid is colored blue for identification purposes. Do not mix low temperature brake fluids with the specified fluid during the bleeding operations. Never re-use brake fluid which has been drained from the hydraulic system.

1. Loosen the bleed screw located on the side of the master cylinder. **Do not use the secondary piston stop screw, located on the bottom of the master cylinder to bleed the brake system. Loosening or removing this screw could result in damage to the secondary piston or stop screw.**
2. To bleed the secondary (rear) brake system, position a suitable 3/8 inch box wrench (Fig. 9) on the bleeder fitting on the brake wheel cylinder. Attach a rubber drain tube to the bleeder fitting. **The end of the tube should fit snugly around the bleeder fitting.**
3. Submerge the free end of the tube in a container partially filled with clean brake fluid, and loosen the bleeder fitting approximately 3/4 turn.
4. Push the brake pedal down slowly through its full travel. Close the bleeder fitting, then return the pedal to the fully-released position. Repeat this operation until air bubbles cease to appear at the submerged end of the bleeder tube.
5. When the fluid is completely free of air bubbles, close the bleeder fitting and remove the bleeder tube.
6. Repeat this procedure at the brake wheel cylinder on the opposite side. Refill the master cylinder reservoir after each wheel cylinder is bled

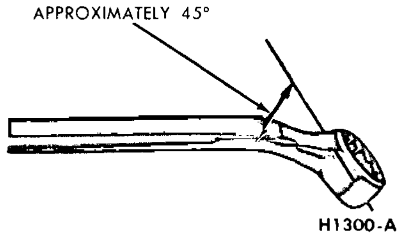


FIG. 9— **Wrench for Bleeding Brake Hydraulic System**

and install the master cylinder cover and gasket. **Be sure the diaphragm type gasket is properly positioned in the master cylinder cover. When the bleeding operation is completed, the fluid level should be filled to within 1/4 to 1/2 inch from the top of the reservoirs.**

7. If the primary (front brake) system is to be bled, remove the front wheel covers, and the front wheel and tire assemblies to gain access to the bleeder fittings on the disc brake calipers. Repeat steps 2 through 6 at the right front disc brake caliper and ending at the left front disc brake caliper.

8. Be sure that the front brake pistons are returned to their normal positions and that the shoe and lining assemblies are properly seated by depressing the brake pedal several times until normal pedal height exists. Install the front wheel and tire assemblies on the front wheels, and torque the mounting bolts to specification. Install the wheel covers.

9. Centralize the pressure differential valve. Refer to the Centralizing the Pressure Differential Valve Procedures which follow.

PRESSURE BLEEDING

Bleed the longest lines first. The bleeder tank should contain enough new Rotunda Brake Fluid to complete the bleeding operation. Use Rotunda Brake Fluid — Extra Heavy Duty — Part Number C6AZ-19542-A (ESA-M6C25-A) or equivalent for all disc brake applications and Rotunda Brake Fluid — Heavy Duty — Part Number B7AZ-19542-A, R103-A or equivalent for power drum or standard drum applications. **The brake fluid is colored blue for identification purposes. Do not mix low temperature brake fluid with the specified disc brake fluid during the bleeding operations. Never re-use brake fluid that has been drained from the hydraulic system.** The tank should be charged with approximately 10 to 30 pounds of air pressure. **Never exceed 50 pounds pressure.**

1. Clean all dirt from the master cylinder reservoir cover.

2. Remove the master cylinder reservoir cover and rubber gasket, and fill the master cylinder reservoir with the specified brake fluid. Install the pressure bleeder adapter tool to the master cylinder, and attach the bleeder tank hose to the fitting on the adapter.

Master cylinder pressure bleeder adapter tools can be obtained from the various manufacturers of pressure bleeding equipment. Follow the instructions of the manufacturer when installing the adapter.

3. Loosen the primary and secondary tube nuts at the master cylinder and bleed the master cylinder until the fluid flow is free of air bubbles, then tighten the tube nuts to the specified torque. Refer to Figs. 20 and 21, Part 2-2. **Do not overtighten the nuts.**

4. If the rear wheel cylinders and the secondary brake system is to be bled, position a 3/8 inch box wrench (Fig. 9) on the bleeder fitting on the right rear brake wheel cylinder. Attach a bleeder tube to the bleeder fitting. **The end of the tube should fit snugly around the bleeder fitting.**

5. Open the valve on the bleeder tank to admit pressurized brake fluid to the master cylinder reservoir.

6. Submerge the free end of the tube in a container partially filled with clean brake fluid, and loosen the bleeder fitting.

7. When air bubbles cease to appear in the fluid at the submerged end of the bleeder tube, close the bleeder fitting and remove the tube.

8. Repeat steps 3 through 7 at the left wheel cylinder of the secondary system being bled.

9. **If the primary (front brake) system is to be bled, remove the front wheel covers, and the front wheel and tire assemblies to gain access to the bleeder fittings on the disc brake calipers.** Repeat steps 4 through 7, starting at the right front disc caliper and ending at the left front disc caliper.

10. If the vehicle contains drum-type front brakes and the primary (front) brake system is to be bled, repeat steps 4 through 7, starting at the right front wheel cylinder and ending at the left wheel cylinder.

11. When the bleeding operation is completed, close the bleeder tank valve and remove the tank hose from the adapter fitting.

12. On disc brake equipped vehicles, be sure that the front brake pistons are returned to their normal positions and that the shoe and lining assemblies are properly seated by depressing the brake pedal several times until normal pedal height is obtained. Install the front wheel and tire assemblies on the front wheels, and torque the mounting bolts to specification. Install the wheel covers.

13. Remove the Pressure Bleeder Adapter Tool. Fill the master cylinder reservoirs to within 1/4 to 1/2 inch from the top. Install the master cylinder cover and gasket. **Be sure the diaphragm-type gasket is properly positioned in the master cylinder cover.**

14. Centralize the pressure differential valve as follows:

CENTRALIZING THE PRESSURE DIFFERENTIAL VALVE

After a failure of the primary (front brake) or secondary (rear brake) system has been repaired and bled, the dual-brake warning light will usually continue to be illuminated due to the pressure differential valve remaining in an off-center position.

To centralize the pressure differential valve and turn off the warning light after a repair operation, a pressure differential or unbalance condition must be created in the opposite brake system from the one that was repaired and bled last.

1. Turn the ignition switch to the ACC or ON position. Loosen the differential valve assembly brake tube nut at the outlet port **on the opposite side of the brake system that was repaired and/or bled last.** Depress the brake pedal **slowly** to build line pressure until the pressure differential valve is moved to a centralized position and the brake warning light goes out; then, immediately tighten the outlet port tube nut to the specified torque. Refer to Fig. 20 and 21.

2. Check the fluid level in the master cylinder reservoirs and fill them to within 1/4 to 1/2 inch of the top with the specified brake fluid, if necessary.

3. Turn the ignition switch to the OFF position.

4. Before driving the vehicle, check the operation of the brakes and be sure that a firm pedal is obtained.

3 CLEANING AND INSPECTION

DISC (FRONT) BRAKES

1. Remove the wheel and tire, caliper splash shield, and the shoe and lining assemblies as outlined in Part 2-2, Section 2.

2. Make three thickness measurements with a micrometer across the middle section of the shoe and lining. Take one reading at each side and one in the center. If the assembly has worn to a thickness of 0.231 inch (shoe and lining together) or 0.066 inch (lining material only) at any one of the three measuring locations or if the brake lining shows evidence of brake fluid contamination, replace all four shoe and lining assemblies on both front wheels.

3. Check the caliper to spindle attaching bolt and caliper bridge bolt torque. Tighten them to the specified torque, if required.

4. To check rotor runout, first eliminate the wheel bearing end play by tightening the adjusting nut. After tightening the nut check to see that the rotor can still be rotated.

5. Clamp a dial indicator to the caliper housing so that the stylus contacts the rotor at a point approximately 1 inch from the outer edge. Rotate the rotor and take an indicator reading. If the reading exceeds 0.002 inch total lateral runout on the indicator, replace or resurface the disc brake rotor. **The following requirements must be met when resurfacing disc brake rotors:**

Rotunda Disc Brake Attachment FRE-2249-2 is the **only approved tool** to be used to refinish the disc brake rotors. The step-by-step resurfacing procedure provided with the tool must be adhered to.

The finished braking surfaces of the rotor must be flat and parallel within 0.0007 inch; lateral runout must not exceed 0.002 inch total indicator reading, and the surface finish of the braking surfaces are to be 85/15 micro inches. **The minimum limiting dimensions (Fig. 10) from the inboard bearing cup to the outboard rotor face (dimension A) and from the inboard bearing cup to the inboard rotor face (dimension B) must be observed when removing material from the rotor braking surfaces.**

When the runout check is finished, be sure to adjust the bearings as outlined in Group 3, in order to prevent bearing failure.

6. Check the rotor for scoring. Minor scores can be removed with a fine emery cloth. If the rotor is excessively scored, refinish it as outlined in step 5 or replace the rotor, if required.

7. Visually check the caliper. If excess leakage is evident, it should be replaced. Slight leakage around the pistons or seized pistons indicate removal and disassembly.

8. If upon disassembly the caliper is found to be distorted or damaged, or if the cylinder bores are scored or excessively worn, replace the assembly.

The two halves of the caliper assembly should never be separated. Damage or failure of one requires replacement of both as a unit.

REAR BRAKES

1. Remove the wheel from the drum, then remove the drum as outlined in Part 2-2, Section 2. Wash all the parts except the brake shoes in a cleaning solvent and dry with compressed air.

2. Brush all dust from the backing plates and interior of the brake drums.

3. Inspect the brake shoes for excessive lining wear or shoe damage. If the lining is worn to within 1/32 inch of the rivet heads or if the shoes are damaged, they must be replaced. Replace any lining that has been contaminated with oil, grease or brake fluid. Replace lining, in axle sets. Prior to replacement of lining, the drum diameter should be checked to determine if oversize linings must be installed.

4. Check the condition of the brake shoes, retracting springs, and drum for signs of overheating. If the springs show any loss of load or change in free length indicating overheating, replacement of the retracting and hold down springs and the parking brake cable is necessary. **Overheated springs lose their pull and could cause the new lining to wear prematurely if they are not replaced.**

5. If the car has 30,000 or more miles of operation, or signs of extreme overheating are present when relining brakes, the wheel cylinders should be disassembled and inspected for wear and dirt in the cylinder. The cylinder cups and other parts contained in the overhaul kit should be replaced thus avoiding future problems.

6. Inspect all other brake parts and replace any that are worn or damaged.

7. Inspect the brake drums and, if necessary, refinish. Refer to Part 2-2, Section 4 for refinishing.

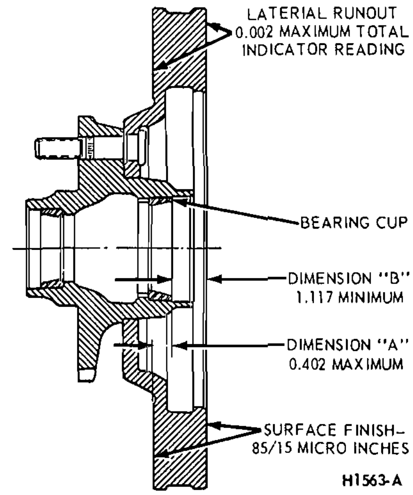


FIG. 10—**Disc Brake Rotor Service Limits — Typical**

BOOSTER UNIT

Check the booster operation as noted in Part 2-1, Section 1, Power Brake Functional Test. If the brake booster is damaged or defective, replace it with a new booster. **The booster is serviced only as an assembly.**

Possible Causes Of Trouble	Excessive Pedal Travel	Brake Roughness or Chatter (Pedal Pumping)	Excessive Pedal Effort	Pull	Rattle	Brakes Heat Up During Driving and Fail to Release	Leaky Wheel Cylinder	Grabbing or Uneven Braking Action	No Braking Effect When Pedal is Depressed	Brakes for the Respective System Do Not Apply	Pedal Gradually Moves Toward Floor or Dashpanel	Warning Lamp Stays Lit	Warning Lamp Does Not Light
Shoe and Lining Knock-back after Violent Cornering or Rough Road Travel	X												
Shoe and Lining Assembly not Properly Seated or Positioned	X				X				X				
Leak or Insufficient Fluid in System or Caliper	X		X						X		X		
Loose Wheel Bearing Adjustment	X			X									
Damaged or Worn Caliper Piston Seal	X						X		X				
Improper Master Cylinder Push Rod Adjustment	X												
Excessive Rotor Runout or Out of Parallel		X											
Incorrect Tire Pressure				X				X					
Frozen or Seized Pistons			X	X		X		X					
Brake Fluid, Oil or Grease on Linings		X	X	X				X					
Shoe and Lining Worn Below Specifications			X										
Proportioning Valve Malfunction			X					X					
Booster Inoperative			X										
Caliper Out of Alignment with Rotor				X				X					
Loose Caliper Attachment	X	X		X	X			X					
Metering Valve Seal Leaks								X					
Excessive Clearance Between Shoe and Caliper or Between Shoe and Splash Shield					X								
Shoe Hold Down Clips Missing or Improperly Positioned					X								
Operator Riding Brake Pedal						X							
Scores in the Cylinder Bore							X						
Corrosion Build-Up in the Cylinder Bore or on the Piston Surface			X	X			X						
Bleeder Screw Still Open									X		X		
Caliper Out of Parallel with Rotor				X									
One Section of Dual Brake System is Inoperative										X		X	
Differential Pressure Valve Is Not Centered												X	
Wiring To Warning Lamp or Switch Is Grounded												X	
Warning Lamp Switch Is Grounded												X	
Warning Lamp Is Burned Out													X
Warning Lamp or Switch Has An Open Circuit													X
Warning Lamp Switch Is Inoperative													X
Wiring To Warning Lamp Has Open Circuit													X

FIG. 11—**Front Wheel Disc Brake Trouble Symptoms and Possible Causes**

Possible Causes Of Trouble	One Brake Drags	All Brakes Drag	Hard Pedal	Spongy Pedal	Car Pulls to One Side	One Wheel Locks	Brakes Chatter	Excessive Pedal Travel	Pedal Gradually Goes to Floor	Brakes Uneven	Shoe Click After Release	Noisy or Grabbing Brakes	Brakes Do Not Apply	Brakes For The Respective System Do Not Apply	Warning Lamp Stays Lit	Warning Lamp Does Not Light
Mechanical Resistance at Pedal or Shoes		X	X													
Brake Line Restricted	X	X	X		X											
Leaks or Insufficient Fluid				X				X	X				X			
Improper Tire Pressure					X					X						
Distorted or Improperly Adjusted Brake Shoe	X	X	X		X	X		X				X				
Faulty Retracting Spring	X				X											
Drum Out of Round	X				X		X									
Lining Glazed or Worn			X		X	X	X	X				X	X			
Oil or Grease on Lining					X	X	X			X		X	X			
Loose Carrier Plate	X					X	X									
Loose Lining							X									
Scored Drum										X		X				
Dirt on Drum-Lining Surface												X				
Faulty Brake Cylinder	X				X	X						X				
Dirty Brake Fluid	X	X								X			X			
Faulty Master Cylinder		X						X	X				X			
Air in Hydraulic System	X			X				X					X			
Self Adjusters Not Operating					X			X								
Insufficient Shoe-to-Carrier Plate Lubrication	X										X	X				
Tire Tread Worn						X										
Poor Lining to Drum Contact							X									
Loose Front Suspension							X									
Threads Left by Drum Turning Tool Pulls Shoes Sideways											X					
Cracked Drum								X								
One Section of Dual Brake System Is Inoperative														X	X	
Differential Pressure Valve Is Not Centered															X	
Wiring To Warning Lamp or Switch Is Grounded															X	
Warning Lamp Switch Is Grounded															X	
Warning Lamp Is Burned Out																X
Warning Lamp or Switch Has An Open Circuit																X
Wiring to Warning Lamp Has Open Circuit																X
Warning Lamp Switch Is Inoperative																X

FIG. 12—Drum Brake and General System Trouble Symptoms and Possible Causes

PART 2-2— Brake System

1 DESCRIPTION AND OPERATION

Disc brakes are available as optional equipment for the front wheels on the various vehicle models listed in (Fig. 1).

The dual-master cylinder equipped hydraulic brake system employs single-anchor, internal expanding and self-adjusting drum brake assemblies on the rear wheels of vehicles with disc brakes, and on the front and rear wheels of all others (Fig. 1).

DUAL-MASTER CYLINDER BRAKE SYSTEM

The dual-master cylinder brake system has been incorporated in all car models to provide increased vehicle safety. The system consists of a dual-master cylinder, pressure differential valve assembly and a switch. The switch on the differential valve activates a dual-brake system warning light, located on the instrument panel.

The dual-master cylinder brake system is similar to a conventional (single) brake master cylinder system. In the dual-system, two master cylinders are combined in a single cast iron casting (Fig. 2). One portion actuates the front brake system and the other actuates the rear brake system (Figs. 20 and 21). Hydraulic fluid leakage or failure of one of the systems does not impair the operation of the other portion of the dual-brake system. A dual-brake warning light signals a failure of either the front or rear brake system.

The dual-master cylinder used on Fairlane, Falcon and Comet vehicles equipped with power brakes have the master cylinder outlet ports for the rear brake system located on the bottom of the master cylinder body. Master cylinder hydraulic system bleed screws are located in the outboard side of those master cylinders having secondary (rear brake) system outlet ports in the bottom of the master cylinder castings (Fig. 29).

All Fairlane, Falcon and Comet vehicles equipped with standard drum brakes and all Mustang and Cougar vehicles equipped with power disc, power drum and standard drum brakes have both the primary (front) and secondary (rear) brake system outlet ports located on the outboard side of the dual-master cylinder body castings. These master cylinders do not require master cylinder bleed screws (Figs. 27, 28 and 30).

The external appearance of the dual master cylinders for the various vehicles also differ in configuration of the covers. All vehicles having standard drum brake systems and Mustang, Cougar vehicles equipped with power drum brakes have primary and secondary master cylinder cover domes of equal size. Dual master cylinders for all other vehicles equipped with power disc and power drum brake systems have large primary (front brake) and smaller secondary (rear brake) cover domes.

A code letter is stamped on the side or outer end of each master cylinder body casting for easy service identification. The vehicle application, type of brakes and the identification code are shown in Fig. 3.

A brake pressure differential valve assembly (Fig. 4) incorporating an hydraulically operated mechanical switch is utilized to operate a dual-brake warning light, located on the instrument panel.

Hydraulic pressure for both front wheel brakes is provided from the primary system (front) brake outlet port and line, located opposite the primary system inlet port of the differential valve.

Hydraulic pressure for both rear wheel brakes is provided from the single secondary (rear brake) outlet line, located opposite the secondary system inlet port of the differential valve. On disc brake equipped vehicles, a proportioning valve is located in the secondary (rear brake) system line that leads to the brake hose bracket on the rear axle housing. The brake hose bracket serves as a junction point for the individual brake lines that lead to the wheel cylinders of right and left rear brake components.

When the brake pedal is depressed, both the primary (front brake) and

secondary (rear brake) master cylinder pistons are moved simultaneously to exert hydraulic fluid pressure on their respective independent hydraulic system. The fluid displacement of the dual-master cylinders is proportioned to fulfill the requirements of each of the two independent hydraulic brake systems (Fig. 2).

If a failure of the rear (secondary) brake system should occur, initial brake pedal movement causes the unrestricted secondary piston to bottom in the master cylinder bore. Primary piston movement displaces hydraulic fluid in the primary section of the dual-master cylinder to actuate the front brake system.

Should the front (primary) brake system fail, initial brake pedal movement causes the unrestricted primary piston to bottom out against the secondary piston. Continued downward movement of the brake pedal moves the secondary piston to displace hydraulic fluid in the rear brake system, actuating the rear brakes.

The increased pedal travel and the increased pedal effort required to compensate for the loss of the failed portion of the brake system provides a warning that a partial brake system failure has occured. When the ignition switch is turned to the START position, a dual-brake warning light provides a visual indication the warning lamp is functional. When the ignition switch is turned to the **ON** or **ACC** position, a dual-brake warning light on the instrument panel also provides a visual indication if one portion of the dual-brake system has become inoperative.

Should a failure of either the front or rear brake hydraulic system occur, the hydraulic fluid pressure differential resulting from the pressure loss of the failed brake system forces the valve toward the low pressure area to illuminate the brake warning light (Fig. 4).

A mechanically operated electrical switch is located on the side of the pressure differential valve assembly between the front and rear brake system inlet ports. The inner-end of the spring loaded switch-plunger contacts the bottom of a tapered shoulder groove in the center of the valve (Fig. 4). O-ring seals are retained in seal ring lands near each end of the valve.

Should a failure of the rear brake system occur, hydraulic fluid pressure in the rear brake system would drop. During brake pedal operation the fluid pressure build-up of the front brake system forces the valve to move toward the low pressure area, or toward

Car Model	Power Drum	Power Disc
Falcon	RPO	Not Available
Fairlane	RPO	RPO ① ③
Mustang ②	RPO	RPO ①
Comet	RPO	RPO ① , ③
Cougar	RPO	RPO

① Standard with Mustang GT equipment group option, Fairlane GT model.
② Mustang brake options available only on eight-cylinder models.
③ Standard for Acc. Fairlane and Comet 427 V-8 Engine.

FIG. 1—Power Disc Brake and Power Drum Brake Options

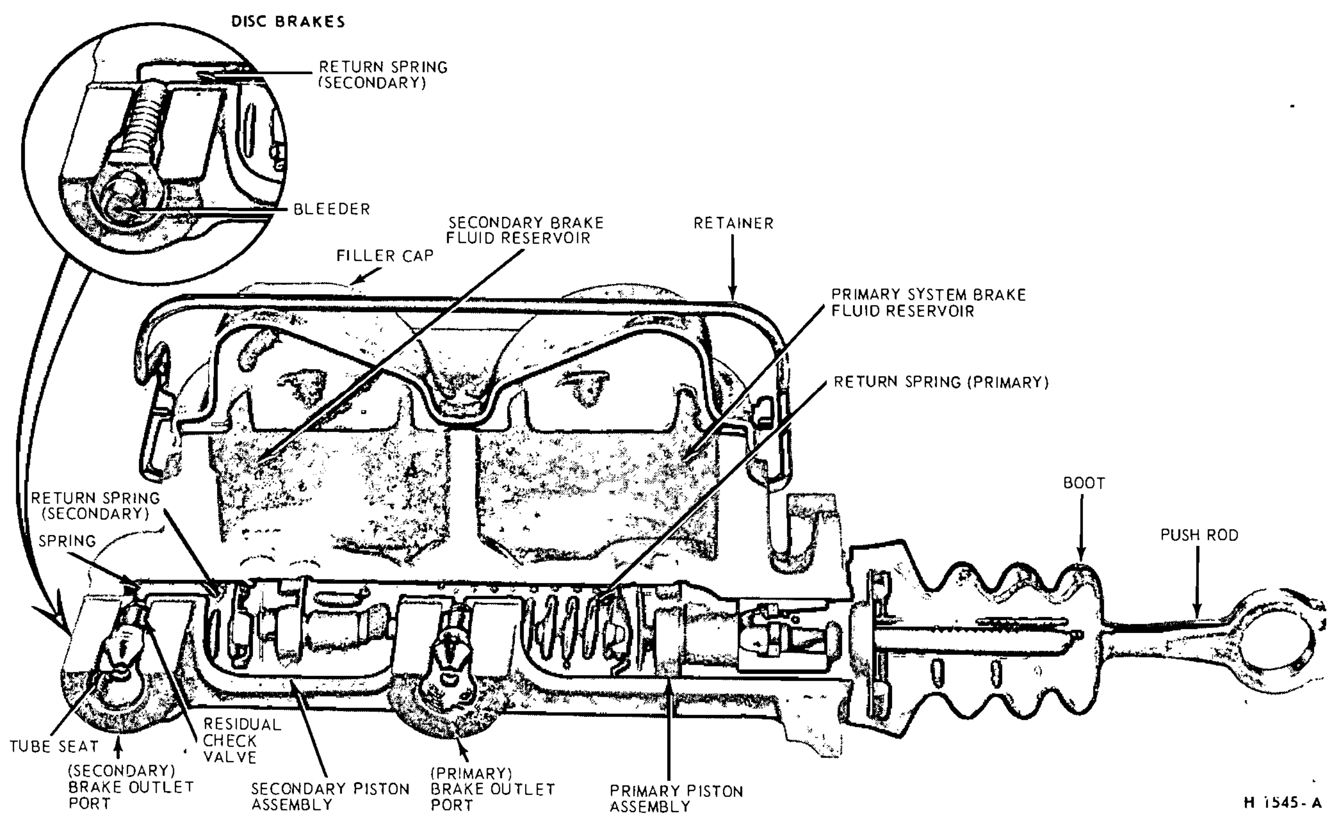


FIG. 2—Dual-Master Cylinder

the rear brake system outlet port (Fig. 4). Movement of the differential valve forces the switch plunger upward over the tapered shoulder of the valve to close the switch electrical contacts and light the dual brake warning lamp, signalling a brake system failure.

In the event a front brake system failure should occur, greater pressure from the rear brake system during brake pedal operation forces the valve forward, moving the switch plunger upward onto the valve ramp to light the brake system warning lamp. **However, failure of either the front or rear system does not impair operation of the other brake system.**

DISC BRAKE ASSEMBLIES

Disc brakes are available as optional equipment for the front wheels. The hydraulic brake system employs single anchor, internal expanding and self-adjusting drum brake assemblies on the rear wheels of vehicles with disc brakes, and on the front and rear wheels of all others.

A vacuum booster is available as optional equipment.

The master cylinder converts physical force from the brake pedal (and booster if so equipped) into hydraulic pressure against the pistons in the calipers (disc brakes) or in the wheel cylinders (drum brakes). The pistons in turn convert hydraulic pressure back into physical force at the brake shoes.

Car Model	Type Of Brake	Identification Code
Fairlane and Falcon	Power Disc	B
	Power Drum	S
	Standard Drum	T
Mustang	Power Disc	M
	Power Drum	X
	Standard Drum	T
Comet	Power Disc	B
	Power Drum	S
	Standard Drum	T
Cougar	Power Disc	M
	Power Drum	X
	Standard Drum	T

FIG. 3—Dual Master Cylinder Identification

RELATION AND FUNCTION OF COMPONENT PARTS

The disc brake is a fixed caliper, opposed piston, non-energized, ventilated disc type, actuated by a hydraulic system (Fig. 5). There is no lateral movement of either the disc (rotor) or the caliper. The caliper assembly consists of two caliper housings bolted together with each half containing two cylinder bores of 1 15/16 inch diameter. Each cylinder bore contains a piston with an attached molded rubber dust boot

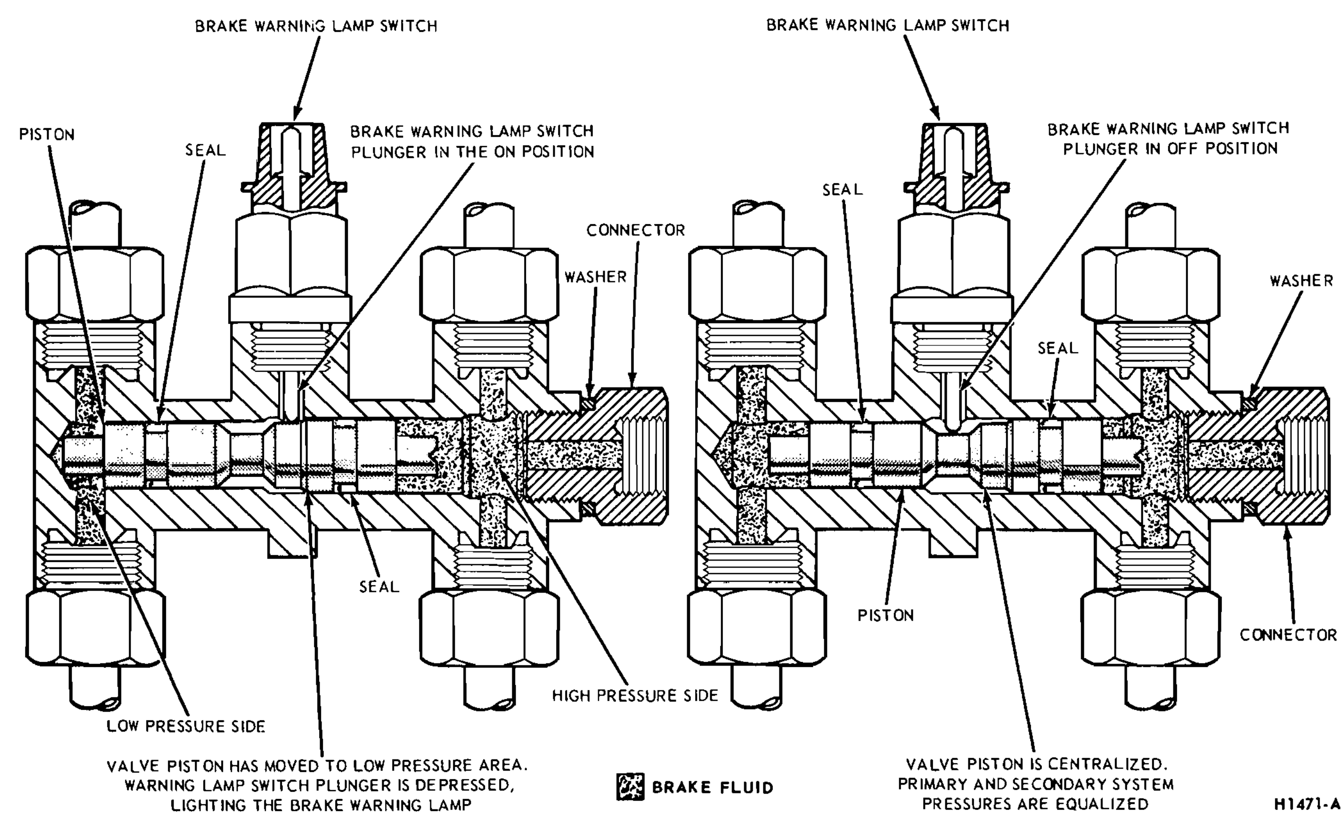


FIG. 4—Pressure Differential Valve and Brake Warning Lamp Switch Operation

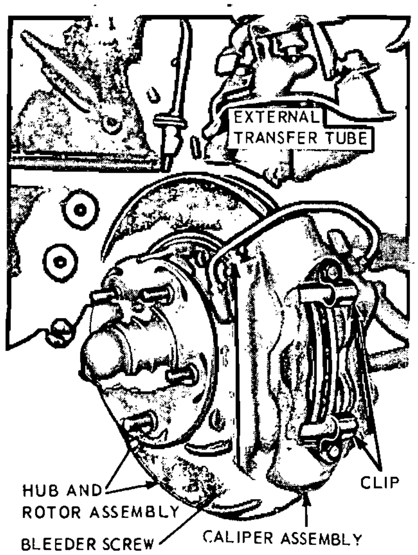


FIG. 5—Typical Disc Brake Assembly

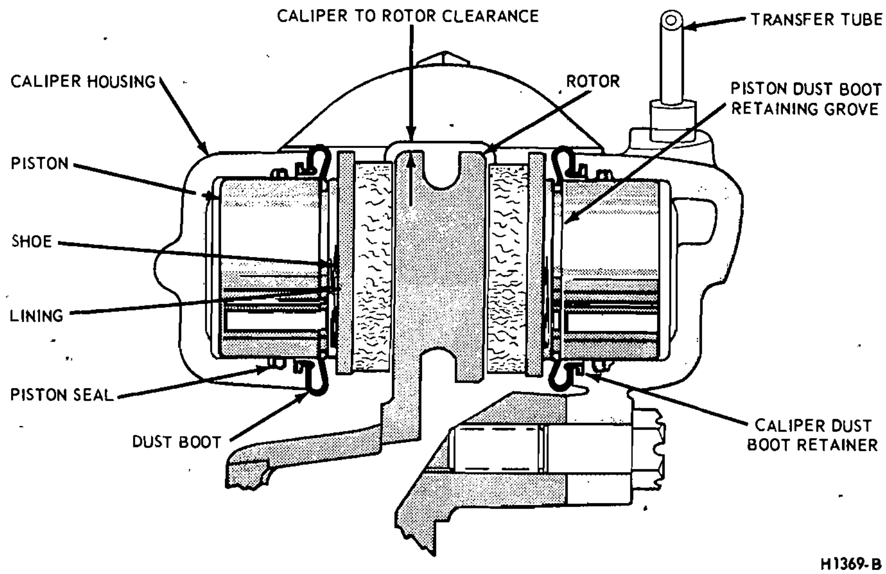


FIG. 6—Typical Caliper Assembly—Sectional View

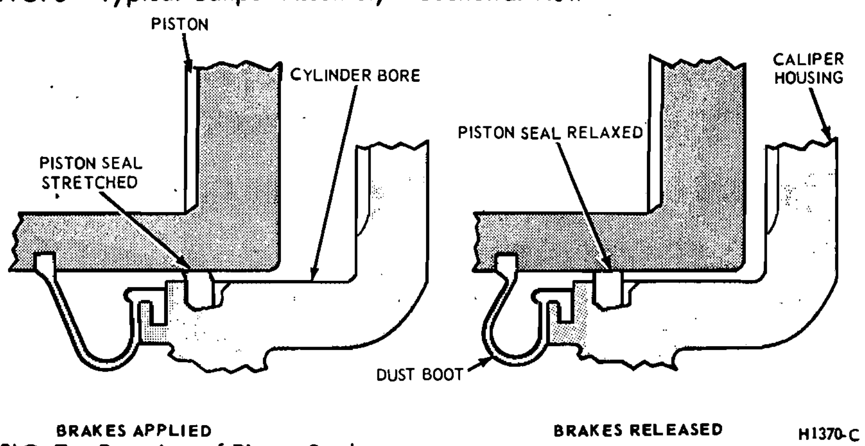


FIG. 7—Function of Piston Seal

to seal the cylinder bore from contamination (Fig. 6). Square-section rubber piston seals are positioned in grooves in the cylinder bores.

The piston seals perform three important tasks:

1. They provide hydraulic sealing between the cylinders and pistons.
2. They return the pistons to released position, when hydraulic pressure is released.
3. They maintain the shoes in correct adjustment at all times (comparable to the automatic adjusters in drum-type brakes).

The cylinders are connected hydraulically by means of internal passages in the caliper housing and an external transfer tube between the two halves of the caliper assembly. One bleeder screw and fluid inlet fitting is provided on each caliper assembly.

The shoe and lining assemblies are located between parallel machined abutments within the caliper, and are supported radially by tabs on the outer ends of the shoe assemblies (Fig. 25). The shoes slide axially in the caliper abutments by means of the tabs which ride on machined ledges (bridges) when hydraulic pressure is applied to the piston (Fig. 6). A shoe and lining assembly consists of friction material bonded to a metal plate called the shoe. It is replaced as a unit. Brake torque is absorbed by the mating of the shoe end against the caliper abutments (Fig. 25). Two spring clips are attached to the top of the caliper to retain the shoe and lining assemblies. The caliper assembly is mounted to a bracket located between the spindle and rotor splash shield, to the front of the wheel vertical centerline.

The cast iron disc is of the ventilated rotor type incorporating forty fins and is attached to, and rotates with, the wheel hub. The outside diameter of the rotor is 11.290 inches and the inside diameter is 7.170 inches. This type of design increases cooling area and permits circulation of air through the rotor resulting in more rapid cooling of the brake. A splash shield bolted to the spindle is used primarily to prevent road contaminants from contacting the inboard rotor and lining surfaces (Fig. 17). The wheel provides protection for the outboard surfaces of the rotor.

As the brake pedal is depressed, hydraulic pressure from the master cylinder forces the pistons out of the caliper bores against their respective shoe and lining assemblies. The force of the pistons against the shoes moves the linings against both sides of the revolving rotor to effect braking action.

During brake application, the rubber seal on each piston stretches as the piston moves against the shoe (Fig. 7). When the hydraulic pressure against the piston is released, the seal relaxes or rolls back. This roll-back action pulls the piston away from the shoe just enough to relieve the force of the lining against the rotor and, thereby, provide the required running clearance. Also, inherent rotor runout contributes to the maintenance of running clearance. Automatic adjustment is achieved by the pistons sliding in the seals outward from the cylinder bores. The piston gradually changes its position relative to the seal as the lining wears and, thus, maintains the correct adjustment location at all times.

When the brakes are in the unapplied position, there is no hydraulic pressure to the calipers because the fluid source at the master cylinder by-passes the residual check valve.

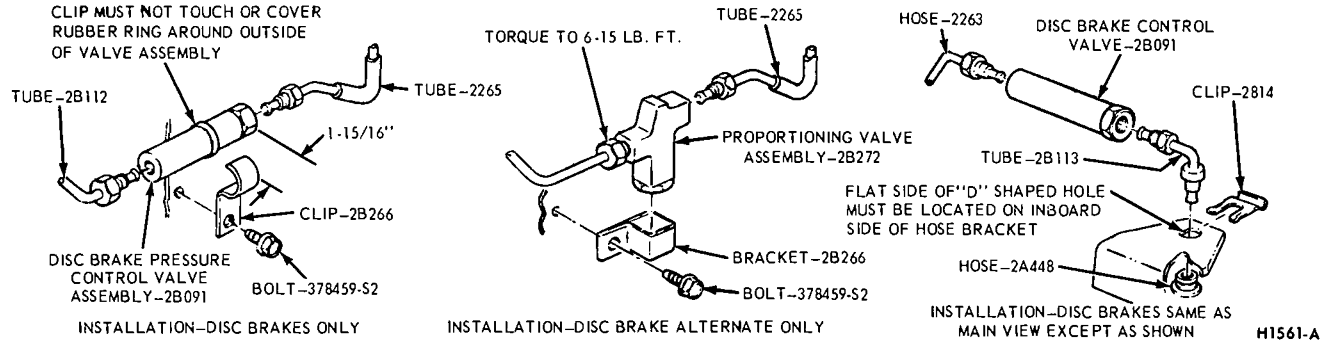


FIG. 8—**Disc Brake Pressure Control Valve**

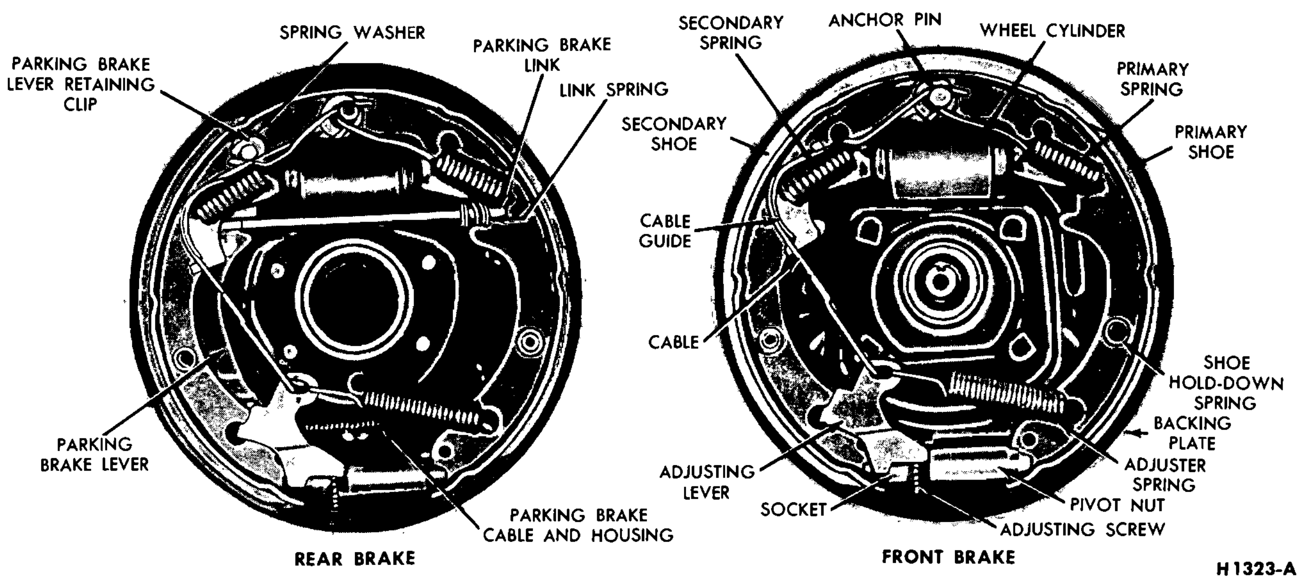


FIG. 9—**Self-Adjusting Brake Assemblies—9 Inch Drum**

A disc brake pressure control valve located between the pressure differential valve and the rear brake wheel cylinders provides balanced braking action between the front and the rear brakes under a wide range of braking conditions (Fig. 8). By regulating the hydraulic pressure applied to the rear wheel cylinders, the valve limits rear braking action when high pressures are required at the front brakes. In this manner, premature rear wheel skid is prevented. **The proportioning valve is serviced as an assembly and is never adjusted or overhauled.**

HYDRAULIC SELF-ADJUSTING BRAKE SYSTEM

The self-adjusting brake mechanism consists of a cable, cable guide, adjusting lever, and adjuster spring (Figs. 9 and 10). The cable is hooked over the anchor pin at the top and is connected to the lever at the bottom. The cable is connected to the secondary brake shoe by means of the cable guide. The adjuster spring is hooked to the primary brake shoe and to the lever. The automatic adjuster operates only when the brakes are applied while the car is moving rearward and only when the secondary shoe is free to move toward the drum beyond a predetermined point.

With the vehicle moving rearward and the brakes applied, the wrap-around action of the shoes following the drum forces the upper end of the primary shoe against the anchor pin. The action of the wheel cylinder moves the upper end of the secondary shoe away from the anchor pin. The movement of the secondary shoe causes the cable to pull the adjusting lever upward and against the end of a tooth on the adjusting screw star-wheel. The upward travel of the lever increases as lining wear increases. When the lever can move upward far enough, it passes over the end of the tooth and engages the tooth. When the brakes are released, the adjusting spring pulls the lever downward causing the star-wheel to turn and expand the shoes. The star-wheel is turned one tooth at a time as the linings progressively wear.

With the vehicle moving forward and the brakes applied, the secondary shoe is against the anchor pin and the primary shoe is moved toward the drum. Therefore, the adjuster does not operate.

The rear brake assembly is basically the same as the front brake. The conventional parking brake lever, link, and spring are used in the rear brake.

The anchor pins on all brakes are fixed and are non-adjustable.

BRAKE BOOSTER SYSTEM

The diaphragm-type brake booster is a self-contained vacuum-hydraulic braking unit mounted on the engine side of the dash panel. The brake booster is of the vacuum suspended type which utilizes engine intake

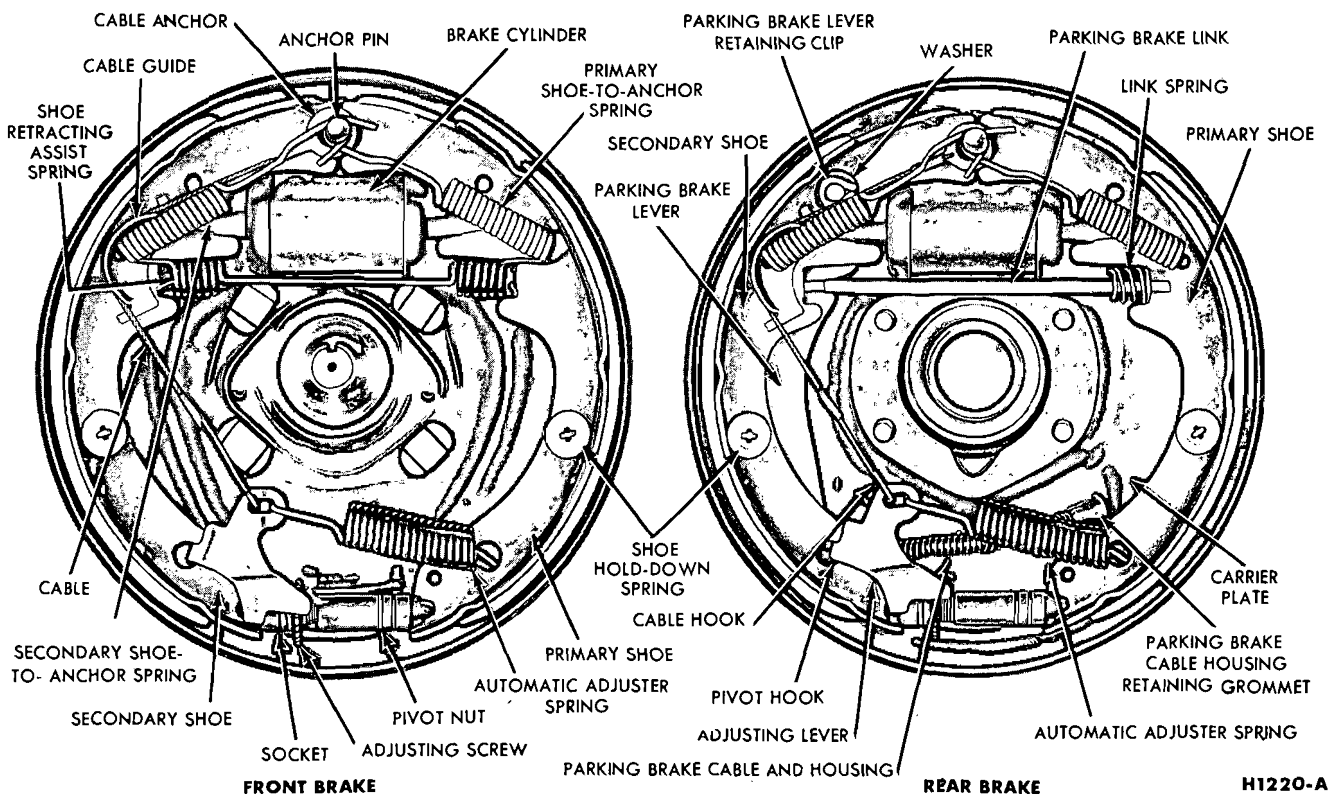


FIG. 10—Self Adjusting Brake Assemblies—10 Inch Drum

manifold vacuum and atmospheric pressure for its power.

Adjustment of the push rod is the only service permitted on a brake booster. The booster unit is to be exchanged when it is inspected, checked and found to be defective.

PARKING BRAKES—MUSTANG AND COUGAR

An independent hand-operated parking brake control actuates the rear wheel brake shoes through a cable linkage. The operating cable is routed from the parking brake control assembly to the equalizer pivot lever which is attached to the equalizer assembly to the floor pan. The rear brake cables connect the equalizer assembly to the parking brake lever at each rear secondary shoe as shown in Figs. 9, 10 and 31.

When the handle is pulled the primary and secondary brake shoes are forced against the rear brake drums. The handle is held in the applied position by the engagement of a spring loaded pawl with a ratchet. Turning the handle counterclockwise disengages the pawl from the ratchet to release the brakes.

PARKING BRAKES—COMET, FAIRLANE AND FALCON

An independent foot-operated parking brake control actuates the rear wheel brake shoes through a cable linkage. The operating cable is routed from the parking brake control assembly to the equalizer. The rear brake cables connect the equalizer assembly to the parking brake lever at each rear secondary shoe (Fig. 9).

When the pedal is depressed the primary and secondary brake shoes are forced against the rear brake drums. The pedal is held in the applied position by the engagement of a spring-loaded pawl with a ratchet in the control assembly (Fig. 32).

The parking brake control assembly is mounted to the cowl inner side panel. The pedal pivots on a stationary pedal mount. A spring-loaded pawl and a release lever are assembled to the pedal. A ratchet is assembled to the upper end of the pedal. The pawl contacts the ratchet at such an angle that the ratchet teeth will slide over the pawl as the pedal is depressed; however, when the applying motion stops and the pedal starts to release, the pawl engages the ratchet and thus locks the brakes in the applied position.

When the manual release lever is pulled back (Fig. 32), the cam action of the lever on the pawl cam pin will disengage the pawl from the ratchet to release the brakes.

2 IN-VEHICLE ADJUSTMENTS AND REPAIRS

After any brake service work, obtain a firm brake pedal before moving the vehicle. Riding the brake pedal (common on left foot applications) should be avoided when driving the vehicle.

BRAKE SHOE ADJUSTMENTS —DRUM BRAKE

The hydraulic service brakes are self-adjusting and require a manual adjustment only after the brake shoes have been relined, replaced, or when the length of the adjusting screw has been changed while performing some other service operation. **The manual adjustment is performed with the drums removed, us-**

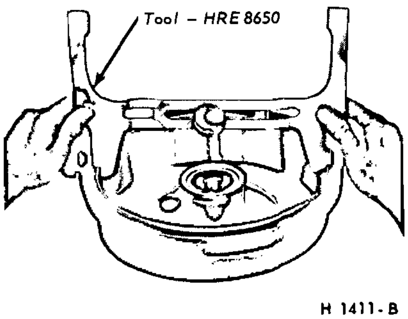


FIG. 11—Measuring Drum

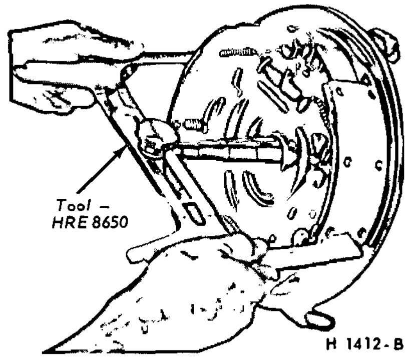


FIG. 12—Measuring Shoes

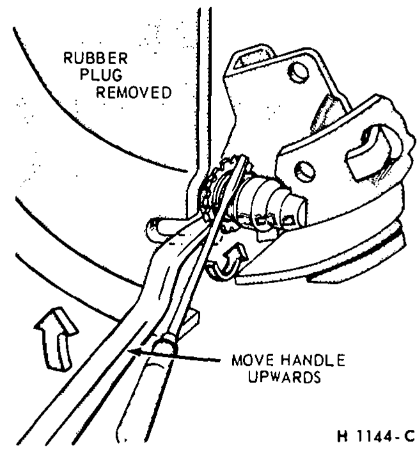


FIG. 13—Backing Off Brake Adjustment

ing the tool and the procedure detailed below.

When adjusting the rear brake shoes, check the parking brake cables for proper adjustment. Refer to Parking Brake Linkage Adjustment, Part 2-1, Section 2. Make sure that the equalizer operates freely.

To adjust the brake shoes:

1. Using Rotunda Tool HRE 8650, (Fig. 11) determine the inside diameter of the drum braking surface.
2. Reverse the tool as shown in Fig. 12 and adjust the brake shoe diameter to fit the gauge. Hold the automatic adjusting lever out of engagement while rotating the adjusting screw, to prevent burring the screw slots. Make sure the adjusting screw rotates freely. If necessary, lubricate the adjusting screw threads with a thin, uniform coating of C1AZ-19590-B Grease.
3. Rotate Tool HRE 8650 around the brake shoes to be sure of the setting.
4. Apply a **small** quantity of high temperature grease to the points where the shoes contact the carrier plate and anchor pin, being careful not to get the lubricant on the linings.
5. Install the drums. Install the Tinnerman nuts and tighten securely. Install the wheel on the drum and tighten the mounting nuts to specification.
6. Complete the adjustment by applying the brakes several times with a minimum of 50 lbs pressure on the pedal while backing the car. After each stop, the vehicle must be moved forward.
7. After the brake shoes have been properly adjusted, check the operation of the brakes by making several stops while operating in a forward direction.

FRONT BRAKE DRUM

REMOVAL

1. Raise the vehicle until the wheel and tire clear the floor. Remove the wheel cover or hub cap, and remove the wheel and tire from the drum.

2. Remove the grease cap from the hub. Remove the cotter pin, nut lock, adjusting nut, and flat washer from the spindle. Remove the outer bearing cone and roller assembly.

3. Pull the hub and drum assembly off the wheel spindle.

4. If the drum will not come off, remove the rubber cover from the brake backing plate. Insert a narrow screwdriver through the slot and disengage the adjusting lever from the adjusting screw. While holding the adjusting lever away from the screw, back off the adjusting screw with the brake adjusting tool (Fig. 13). **Be very careful not to burr, chip, or damage the notches in the adjusting screws; otherwise the self-adjusting mechanism will not function properly.**

INSTALLATION

1. If the drum is being replaced, remove the protective coating from the new drum with carburetor degreaser; then, sand lightly and wipe with a cloth soaked with denatured alcohol. Install new bearings and grease retainer. Soak the new service-type grease retainer in light engine oil for at least 30 minutes before installation if retainer is of a leather composition. Pack the wheel bearings, install the inner bearing cone and roller assembly in the inner cup, and install the new grease retainer. See Part 3-5, Section 4 for procedure.

If the original drum is being installed, make sure that the grease in the hub is clean and adequate.

2. Adjust the brakes and install the drum assembly as outlined under Brake Shoe Adjustments in this section.

3. Install the outer wheel bearing, washer and adjusting nut.

4. Adjust the wheel bearing as outlined in Part 3-5, Section 2, then install the grease cap. Install the wheel and hub cap or cover.

REAR BRAKE DRUM

REMOVAL

1. Raise the vehicle so that the wheel is clear of the floor.

2. Remove the hub cap and wheel. Remove the three Tinnerman nuts and remove the brake drum. If the drum will not come off, remove the rubber cover from the backing plate. Insert a narrow screwdriver through the hole in the backing plate, and disengage the adjusting lever from the adjusting screws. While holding the adjusting lever away from the adjusting screw, back off the adjusting screw with the brake adjusting tool (Fig. 13). **Be very careful not to burr, chip or damage the notches in the adjusting screw; otherwise, the self-adjusting mechanism will not function properly.**

INSTALLATION

1. Remove the protective coating from a new drum with carburetor degreaser; then, sand lightly and wipe with a cloth soaked in denatured alcohol.

2. Adjust the brakes as outlined under Brake Shoe Adjustments in this section.

3. Place the drum over the brake assembly and into position. Install the three Tinnerman nuts and tighten them securely. Install the wheel on the axle shaft flange studs against the drum, and tighten the attaching nuts to specifications.

BRAKE SHOES AND ADJUSTING SCREW

REMOVAL

1. With the wheel and drum removed, install a clamp over the ends of the wheel cylinder as shown in Fig. 14.

2. Remove the brake retracting springs using Tool 2035-N or 2086-L (Fig. 14).

3. Disconnect the brake shoe hold-down springs and remove the brake shoe assemblies along with the complete automatic adjustment mechanism.

4. Disassemble the brake shoes.

5. On rear brakes, remove the parking brake link and spring from the brake assemblies. Disconnect the parking brake cable from the parking brake lever.

6. After removing the rear brake shoes disassemble the parking brake lever from the secondary shoe by removing the retaining clip and spring washer (Figs. 9 and 10).

INSTALLATION

1. Before installing the rear brake shoes, assemble the parking brake lever to the secondary shoe and secure it with the spring washer and retaining clip.

2. Apply a light coating of high-temperature grease at the points where the brake shoes contact the backing plate.

3. Position the brake shoes on the backing plate and secure them with the hold down springs. On the rear brake, install the parking brake link and spring. Connect the parking brake cable to the parking brake lever (Figs. 9 and 10).

Install the cable guide on the secondary shoe web with the flanged hole properly fitted into the hole in the secondary shoe web. Install the secondary spring (secondary shoe to anchor spring) (Figs. 9 and 10).

5. Place the cable eye over the anchor pin with the crimped side toward the backing plate. Install the primary shoe to anchor spring with the tool shown in Fig. 15.

6. Thread the cable around the cable guide groove.

It is imperative that the cable be positioned in this groove and not between the guide and the shoe web. Be certain that the cable eye is not cocked or binding on the anchor pin when installed. All parts should be flat on the anchor pin. Remove the brake cylinder clamp.

7. Apply a small amount of high-temperature grease (Part Number C1AZ-19580-B) to the threads and the socket end of the adjusting screw. Turn the adjusting screw into the adjusting pivot nut to the limit of the threads and then back off 1/2 turn.

Interchanging the brake shoe adjusting screw assemblies from one side of the vehicle to the other would cause the brake shoes to retract rather than expand each time the automatic adjusting mechanism operated. To prevent accidental installation of the adjusting screw on the wrong side of the vehicle the socket end of the adjusting screw is stamped with an R or L (Fig. 16). The adjusting pivot nuts can be distinguished by the number of grooves machined around the body of the nut. Two grooves indicate a right-hand nut; one groove indicates a left-hand nut.

8. Place the adjusting socket on the screw and install this assembly between the shoe ends with the adjusting screw toothed wheel nearest the secondary shoe.

9. Hook the cable hook into the hole in the adjusting lever. The adjusting levers are stamped with an R or L to indicate their installation on a right or left brake assembly (Fig. 16).

10. Position the hooked end of the adjuster spring completely into the large hole in the primary shoe web. The last coil of the spring should be at the edge of the hole. Connect the loop end of the spring to the adjuster lever hole (Figs. 9 and 10).

11. Pull the adjuster lever, cable and automatic adjuster spring down and toward the rear to engage the pivot hook in the large hole in the secondary shoe web.

12. After installation, check the action of the adjuster by pulling the section of the cable between the cable guide and the anchor pin toward the secondary shoe web far enough to lift the lever past a tooth on the adjusting screw wheel. The lever should snap into position behind the next tooth, and release of the cable should cause the adjuster spring to return the lever to its original position. This return action of the lever will turn the adjusting screw one tooth.

If pulling the cable does not produce the action described, or if the lever action is sluggish instead of positive and sharp, check the position of the lever on the adjusting screw toothed wheel. With the brake in a vertical position (anchor at the top), the lever should contact the adjusting wheel 3/16 inch (plus or minus 1/32 inch) above the centerline of the screw. If the contact point is below the centerline, the lever will not lock on the teeth in the adjusting screw wheel, and the screw will not be turned as the lever is actuated by the cable.

To determine the cause of this condition:

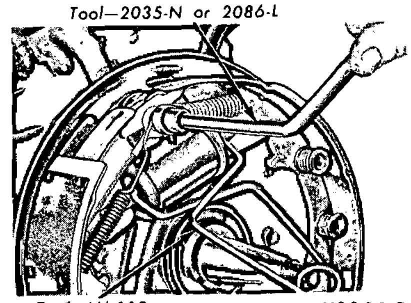
a. Check the cable end fittings. The cable should completely fill or extend slightly beyond the crimped section of the fittings. If it does not meet this specification, possible damage is indicated and the cable assembly should be replaced.

b. Check the cable length. The cable should measure 8 13/32 inches on 9 inch brakes or 9 3/4 inches on 10 inch brakes from the end of the cable anchor to the end of the cable hook.

c. Check the cable guide for damage. The cable groove should be parallel to the shoe web, and the body of the guide should lie flat against the web. Replace the guide if it shows damage.

d. Check the pivot hook on the lever. The hook surfaces should be square with the body of the lever for proper pivoting. Replace the lever if the hook shows damage.

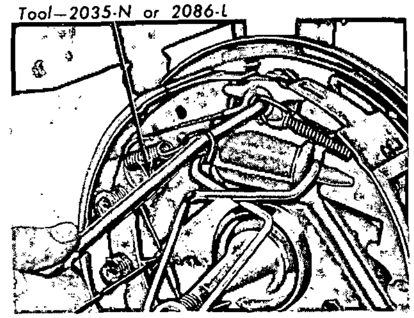
Tool—2035-N or 2086-L



Tool—LM-119 H1146-B

FIG. 14—Retracting Spring Removal —Typical

Tool—2035-N or 2086-L



Tool—LM-119 H1147-B

FIG. 15—Retracting Spring Installation —Typical

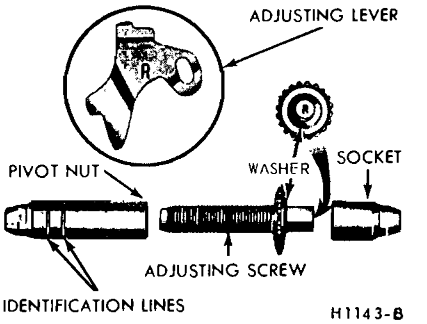


FIG. 16—**Adjusting Screw and Lever Identification**

e. See that the adjusting screw socket is properly seated in the notch in the shoe web.

DISC BRAKE SHOE AND LINING REPLACEMENT

DISC BRAKE SERVICE PRECAUTIONS

1. After any brake service work, pump the brake pedal to obtain a firm pedal before moving the car. Riding the brake pedal (common on left foot applications) should be avoided when driving the car.

2. Grease or any other foreign material must be kept off the caliper assembly, surfaces of the rotor and external surfaces of the hub during service operations. Handling of the rotor and caliper assemblies should be done in a way to avoid deformation of the brake rotor and nicking or scratching of brake linings.

3. If the square sectioned rubber piston seals are worn or damaged, they should be replaced immediately.

4. During removal and installation of a wheel assembly, exercise care not to interfere with and damage the caliper splash shield, the bleeder screw fitting or the transfer tube.

5. Front wheel bearing end play is critical and must be within specifications.

6. Be sure the vehicle is centered on the hoist before servicing any front end components, to avoid bending or damaging the rotor splash shield on full right or left wheel turns.

7. The bridge bolts joining the two caliper housings should not be removed or loosened.

8. The proportioning valve should not be disassembled or adjustments attempted on it.

9. The wheel and tire must be removed separately from the brake rotor, unlike drum brakes where the wheel, tire and drum are removed as a unit.

REMOVAL

Refer to Fig. 17.

1. Remove the wheel and tire from the hub and rotor assembly. **Be careful to avoid damage or interference with the bleeder screw fitting or transfer tube.**

2. Remove the two bolts that attach the caliper brake shoe retaining clips, and remove the clips (Fig. 17).

3. To facilitate removal and installation of the shoe and lining assemblies, the pistons must be pushed into their bores. Apply a steady inward pressure against each shoe and lining assembly toward its respective caliper housing on each side of the rotor (Fig. 6). Maintain the pressure for at least a minute. If the pistons will not go in easily, force them in with water pump pliers.

4. Grasp the metal flange on the outer end of the shoe with two pairs of pliers and pull the shoe out of the caliper (Fig. 18).

INSTALLATION

Refer to Fig. 17.

When new shoe and lining assemblies are being installed to replace worn linings, it will be necessary to push the pistons all the way into the caliper bore. This will displace fluid from the caliper into the master cylinder reservoir. Check the primary (front) brake system reservoir level and remove fluid to approximately half-full before replacing brake shoes. This will prevent overflow. **Do not re-use the removed fluid.**

1. Position a new shoe and lining assembly on each side of the rotor so that the lining faces the rotor.

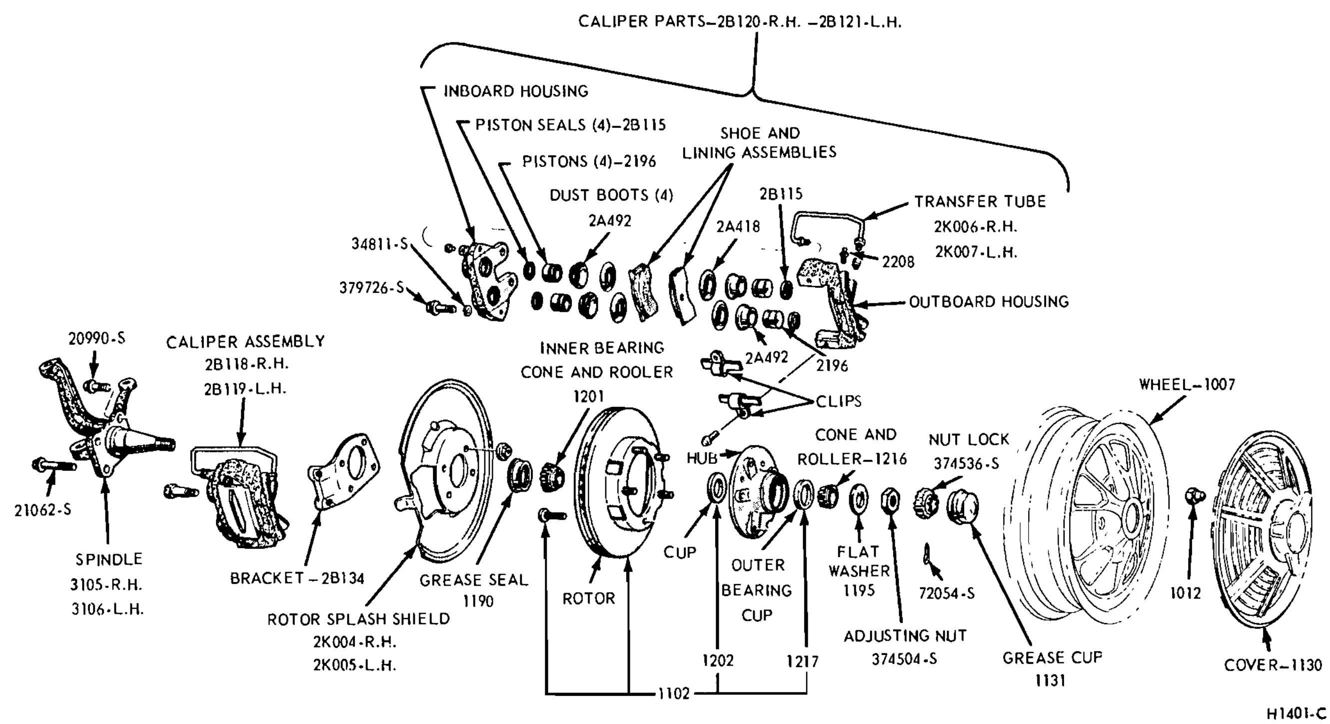


FIG. 17—**Disc Brake Disassembled**

Be sure that the tabs on the shoe flanges seat fully against the caliper bridges (Fig. 18).

2. Position the spring clips on the calipers and install the retaining bolts and washers (Fig. 17).

3. **Pump the brake pedal several times until a firm pedal is obtained and the shoe and lining assemblies are properly seated.**

4. Install the wheel and tire on the hub and rotor assembly.

5. Check and refill the master cylinder reservoir with specified brake fluid as required. **It should not be necessary to bleed the system after a shoe and lining replacement.**

6. Road test the vehicle.

DISC BRAKE CALIPER ASSEMBLY

REMOVAL

Refer to Figs. 17 and 25.

1. Remove the front wheel cover. Remove the wheel and tire from the hub and rotor assembly. **Be careful to avoid damage or interference with the caliper bleeder screw fitting or transfer tube.**

2. Disconnect the steel brake line transfer tube from the caliper. Disconnect the front brake tube assembly from the brake hose.

3. Remove the spring lock clip. Remove the hose from the caliper. Remove the two bolts attaching the caliper assembly to the spindle. **Take care to avoid loosening the bridge bolts that hold the two halves of the caliper together.**

4. Lift the caliper assembly off the rotor and place it on the bench.

INSTALLATION

Refer to Figs. 17 and 25.

1. Position the caliper assembly on the rotor, and mate the mounting bolt holes on the caliper with those in the spindle. It may be necessary to push the caliper pistons into the cylinder bores to obtain clearance between the shoe and lining assembly and the rotor. The shoe and lining assemblies should be seated properly on the bridges.

2. Install the caliper to spindle attaching bolts and torque them to specification. Install the safety wire on the bolts (if so equipped). Check to insure that the rotor runs squarely and centrally between the two halves of the caliper. There should be approximately 0.090—0.120 inch clearance between the caliper and the rotor outside diameter (Fig. 6).

3. Position a new gasket between the hose fitting and caliper. Connect the hose to the caliper and torque it to specification. Refer to Figs. 20 and 21. Position the caliper assembly to the spindle. Install the retaining bolts and torque them to specification. Install the safety wire (if so equipped) on the bolts. Install the female fitting end of the hose in the side-rail bracket. **The stripe on the hose must show no evidence of twist.**

4. Install the spring lock clip. Connect the tube assembly to the hose, and torque the tube connector to specification. Refer to Figs. 20 and 21. Bleed the brake system and centralize the differential valve as outlined in Part 2-1. Check the master cylinder fluid level and add the specified fluid, as required. **Pump the brake pedal several times to actuate the piston seals and to position the shoe and lining assemblies.**

5. Install the wheel and tire and the wheel cover.

6. Road test the vehicle.

FRONT WHEEL HUB AND ROTOR ASSEMBLY—DISC BRAKES

REMOVAL

1. Remove the wheel and tire from the hub and rotor assembly (Fig. 17). **Be careful to avoid damage or interference with the caliper splash shield bleeder screw fitting or transfer tube.**

2. Remove the caliper assembly from the spindle and the rotor. If the caliper does not require servicing, it is not necessary to disconnect the brake hose or remove the caliper from the vehicle. Position the caliper out of the way, and support it with a wire to avoid damaging the caliper or stretching the hose. Insert a **clean** cardboard spacer between the linings to prevent the pistons from coming out of the cylinder bores while the caliper is removed.

Handle the rotor and caliper assemblies in such a way as to avoid deformation of the rotor and nicking, scratching or contamination of the brake linings.

3. Remove the grease cap from the hub. Remove the cotter pin, nut lock, adjusting nut, and flat washer from the spindle. Remove the outer bearing cone and roller assembly.

4. Remove the hub and rotor assembly from the spindle.

INSTALLATION

1. If the rotor is being replaced, remove the protective coating from the new rotor with carburetor degreaser. Pack a new set of bearings with specified grease, and install the inner bearing cone and roller assembly in the inner cup. Pack grease lightly between the lips of a new grease retainer and install the retainer (Fig. 17).

If the original rotor is being installed, make sure that the grease in the hub is clean and adequate, that the inner bearing and grease retainer are lubricated and in good condition, and that the rotor braking surfaces are clean.

2. Install the hub and rotor assembly on the spindle.

3. Lubricate and install the outer wheel bearing, washer and adjusting nut.

4. Adjust the wheel bearings to specification, and then install the nut lock, cotter pin, and grease cap. **The wheel bearing adjustment is especially important with disc brakes.**

5. Mount the caliper assembly on the mounting bracket and torque the two attaching bolts to specification. If necessary, push the caliper pistons into the cylinder bores to obtain clearance between the shoe and lining assemblies and the rotor. Be sure that the shoe and lining assemblies are seated on the bridges. Check the flexible hose for correct routing.

6. Install the wheel, tire and cover on the hub and rotor assembly.

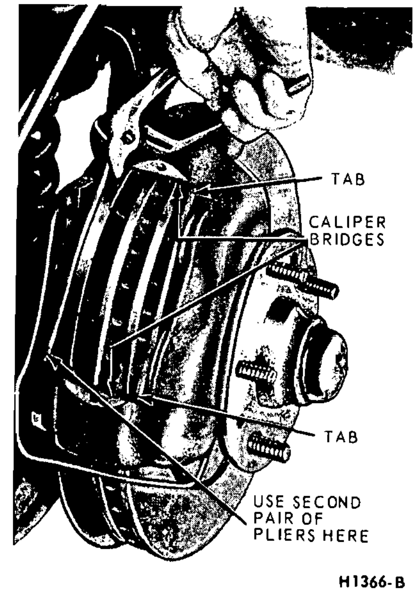


***FIG. 18*—Removing Disc Brake Shoe and Lining Assembly—Typical**

DISC BRAKE ROTOR SPLASH SHIELD

REMOVAL

1. Remove the caliper and the hub and rotor assembly as outlined under Removal in the foregoing procedure.
2. Remove the four nuts that attach the splash shield to the mounting bracket and remove the shield (Fig. 17).
3. Remove the gasket.

INSTALLATION

1. Install the gasket.
2. If the shield is bent, straighten it out before installation. Position the shield to the mounting bracket, install the attaching nuts, and torque to specification (Fig. 17).
3. Install the hub and rotor assembly and the caliper as outlined under Installation in the foregoing procedure.

DISC BRAKE PRESSURE CONTROL VALVE

The disc brake pressure control valve is serviced as an assembly and is never adjusted or overhauled.

Refer to View P of Fig. 20 for the Fairlane, Falcon and Comet disc brake pressure control valve installation. View R of Fig. 21 shows the installation of the Mustang and Cougar disc brake pressure control valve.

REMOVAL

1. Disconnect the brake tubes at the disc brake pressure control valve. On a Mustang and Cougar vehicle, remove the control valve.

2. On a Fairlane, Falcon or Comet vehicle, remove the attaching bolt and clip and remove the disc brake pressure control valve.

INSTALLATION

1. On a Fairlane, Falcon or Comet vehicle, position the disc brake pressure control valve, clip and attaching bolt as shown in Fig. 21, View P, and tighten the attaching bolt.

2. Connect the brake lines to the disc brake pressure control valve, and torque the connector nuts to specification (Figs. 20 and 21).

3. Bleed the brake system and centralize the differential pressure valve. Refer to Part 2-1, Section 2 for the correct procedure.

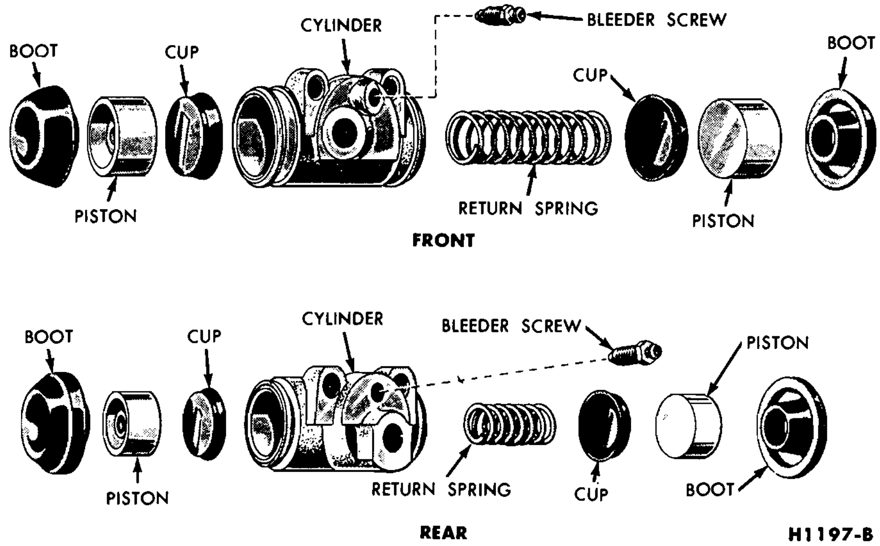


FIG. 19—**Front and Rear Wheel Cylinders**

WHEEL CYLINDER REPAIR

Wheel cylinders should not be disassembled unless they are leaking or unless new cups and boots are to be installed.

It is not necessary to remove the wheel cylinder from the backing plate to disassemble, inspect and overhaul it. Removal is necessary only when the cylinder is damaged or scored beyond repair.

DISASSEMBLY

1. With the wheel in a raised position, remove the wheel and the drum.
2. Place a clamp over the ends of the brake cylinder as shown in Fig. 14.
3. Remove the brake shoe assemblies following procedure outlined in this section.
4. The 6-cylinder Falcon and Mustang models are not provided with links. Remove the rubber boots from the ends of the piston.

On 8-cylinder models and on all Comets and Fairlanes, remove the links and rubber boots from the ends of the piston. Remove the pistons, cups, and return spring from the cylinder bore (Fig. 19).

5. Remove the bleeder screw from the cylinder.

INSPECTION

1. Wash all parts in clean specified brake fluid. Dry with compressed air.
2. Check all the internal parts for excessive wear or damage. Replace scored pistons. Always replace the rubber cups and dust boots. **If any of the internal parts require replacing, all should be replaced.**
3. Inspect the cylinder bore for score marks or rust. If either condition is present, the cylinder bore must be honed. **However, the cylinder should not be honed more than 0.003 inch beyond its original diameter.** A baffle in the front wheel cylinder of the 6-cylinder Falcon and Mustang models prevents honing; therefore, the cylinder must be replaced.
4. Check the bleeder hole to be sure that it is open.

ASSEMBLY

1. Apply a light coating of heavy-duty brake fluid to all internal parts.
2. Thread the bleeder screw into the cylinder and tighten securely.
3. Insert the return spring, cups, and pistons into their respective positions in the cylinder bore (Fig. 19). Place a boot over each end of the cylinder. On 8-cylinder model Mustangs, Cougars, Falcons and all Comets and Fairlanes, install the links in the ends of the brake cylinders.
4. Install the shoe and adjuster assemblies, then adjust the shoes as outlined in this section.
5. Install the brake drum and wheel, then bleed the brakes and centralize the differential valve (Part 2-1, Section 2).

WHEEL CYLINDER REPLACEMENT

REMOVAL

1. With the wheel in a raised position, remove the wheel and the drum.

2. Place a clamp over the ends of the wheel cylinder as shown in Fig. 14).

3. Remove the brake shoe assemblies; following procedures outlined in this section.

4. Disconnect the brake line from the brake cylinder.

To disconnect the hose at a front cylinder, remove the tube fitting that connects the opposite end of the hose to the brake tube at a bracket on the side rail. Remove the horseshoe-type retaining clip from the hose and bracket, disengage the hose from the bracket, then unscrew the entire hose assembly from the front wheel cylinder.

At a rear cylinder, unscrew the tube fitting that connects the tube to the cylinder. **Do not pull the metal tube away from the cylinder. Pulling the tube out of the cylinder connection will bend the metal tube and make installation difficult.** The tube will separate from the cylinder when the cylinder is removed from the backing plate.

5. Remove the wheel cylinder attaching bolts and lock washers and remove the cylinder.

INSTALLATION

Wipe the end(s) of the hydraulic line to remove any foreign matter before making connections.

1. To install a front cylinder:

a. Position the cylinder in place against the backing plate. Install the two lock washers and attaching bolts. Torque them to specifications.

b. Install a new copper gasket over the hose fitting. Thread the hose assembly into the cylinder and tighten it to specified torque (Figs. 20 and 21).

c. Engage the opposite end of the hose to the bracket on the frame. **The stripe on the hose assembly must show no evidence of twist. The brake hose must not touch any other parts during a turn, jounce or rebound.** Install the horseshoe-type retaining clip, and connect the brake tube to the hose with the tube fitting nut. Tighten the nut to specifications with Tool 1112-144.

2. To install a rear cylinder:

a. Position the rear wheel cylinder in place against the backing plate. Enter the tubing into the cylinder, and start the tube fitting nut into the threads of the cylinder.

b. Secure the cylinder to the carrier plate with the attaching bolts and lock washers.

c. Tighten the tube fitting nut to specifications.

3. Install the links in the ends of the wheel cylinder (8-cylinder models only on Falcon, Mustang, Cougar and all Comet and Fairlane models).

4. Install the brake shoes as detailed in this section.

5. Adjust the brakes as detailed in Part 2-2, Section 2.

6. Install the brake drums and wheels.

7. Bleed the brakes and centralize the differential valve as detailed in Part 2-1, Section 2.

BRAKE BACKING PLATE REPLACEMENT

REMOVAL

1. Remove the wheel and brake drum. Disconnect the brake line from the brake cylinder.

2. Remove the brake shoe and adjuster assemblies and the wheel cylinder as outlined in this section. On the rear wheels, disconnect the parking brake lever from the cable.

3. If the rear backing plate is being replaced, rotate the axle shaft so that the hole in the axle shaft flange lines up with the carrier plate retaining nuts and remove the nuts. Pull the axle shaft assembly out of the housing with tool 4235-C and a slide hammer (Part 4-2), then remove the backing plate. **Use care to prevent damage to the rear axle bearing seal.**

If the front backing plate is being replaced, remove the bolts and nuts that secure the plate to the front wheel spindle and remove the plate.

INSTALLATION

1. Position a new rear backing plate on the attaching bolts in the axle housing flange. Insert the axle shaft into the housing so that the splines engage the differential side gear with the bearing retainer sliding onto the retaining bolts and against the backing plate. **Use care to prevent damage to the rear axle bearing seal.** Install the attaching nuts through the access hole in the axle shaft flange.

Refer to Group 4, Part 4-2 for the proper installation procedure.

Position a new **front** backing plate to the wheel spindle and install the attaching bolts and nuts.

2. Install the wheel cylinder and connect the brake line as outlined in this section.

3. Install the brake shoe and adjuster assemblies as outlined in this section. On a rear brake, connect the parking brake cable to the lever.

4. Adjust the brake shoes (Section 2).

5. Install the brake drum and wheel. Bleed the brake system and centralize the differential valve as outlined in Part 2-1, Section 2.

HYDRAULIC LINES

Steel tubing is used throughout the brake system with exception of the flexible hoses at the front wheels and at the rear axle housing brake tube connector (Figs. 20 and 21).

Always bleed the applicable primary (front) or secondary (rear) brake system after a primary or secondary brake system hose or line replacement. Centralize the differential valve after bleeding the brake system because vibration will cause tube failure. When bending brake tubing to fit underbody or rear axle contours, be careful not to kink or crack the tube.

All brake tubing should be properly double-flared at both ends to provide good leak-proof connections. Clean the brake tubing by flushing with clean brake fluid before installation.

When connecting a tube to a hose, tube connector, disc caliper, or brake cylinder, tighten the tube fitting nut to specified torque (Figs. 20 and 21) with Milbar tool 1112-144 or equivalent.

BRAKE HOSE REPLACEMENT

If the vehicle is equipped with disc brakes on the front wheels, it will be necessary to remove the front wheel cover, wheel and tire to replace the brake hose.

When installing a new front brake hose, make certain it is replaced with the proper hose assembly. Install a new gasket over the hose fitting and torque the hose assembly to the wheel cylinder or caliper connection as noted in Figs. 20 and 21. Install the hose into the bracket on the side rail. **Make sure the stripe on the hose shows no evidence of twist.** Install the retaining clip. Connect the tube assembly to the hose, and torque the connector to specification (Figs. 20 and 21).

A rear brake hose should be installed so that it does not touch the muffler outlet pipe or shock absorber.

Since the rear brake hose is integral with the rear brake tube connector, the entire hose and connector is replaced as an assembly. Mount the connector to the rear axle housing with the attaching bolt (axle vent) and lock washer. Connect the two rear wheel brake tubes to the connector. Install the hose in the D slot in the rear hose bracket. Install clip. Connect the tube assembly to the hose, and torque the connector to specification (Figs. 20 and 21).

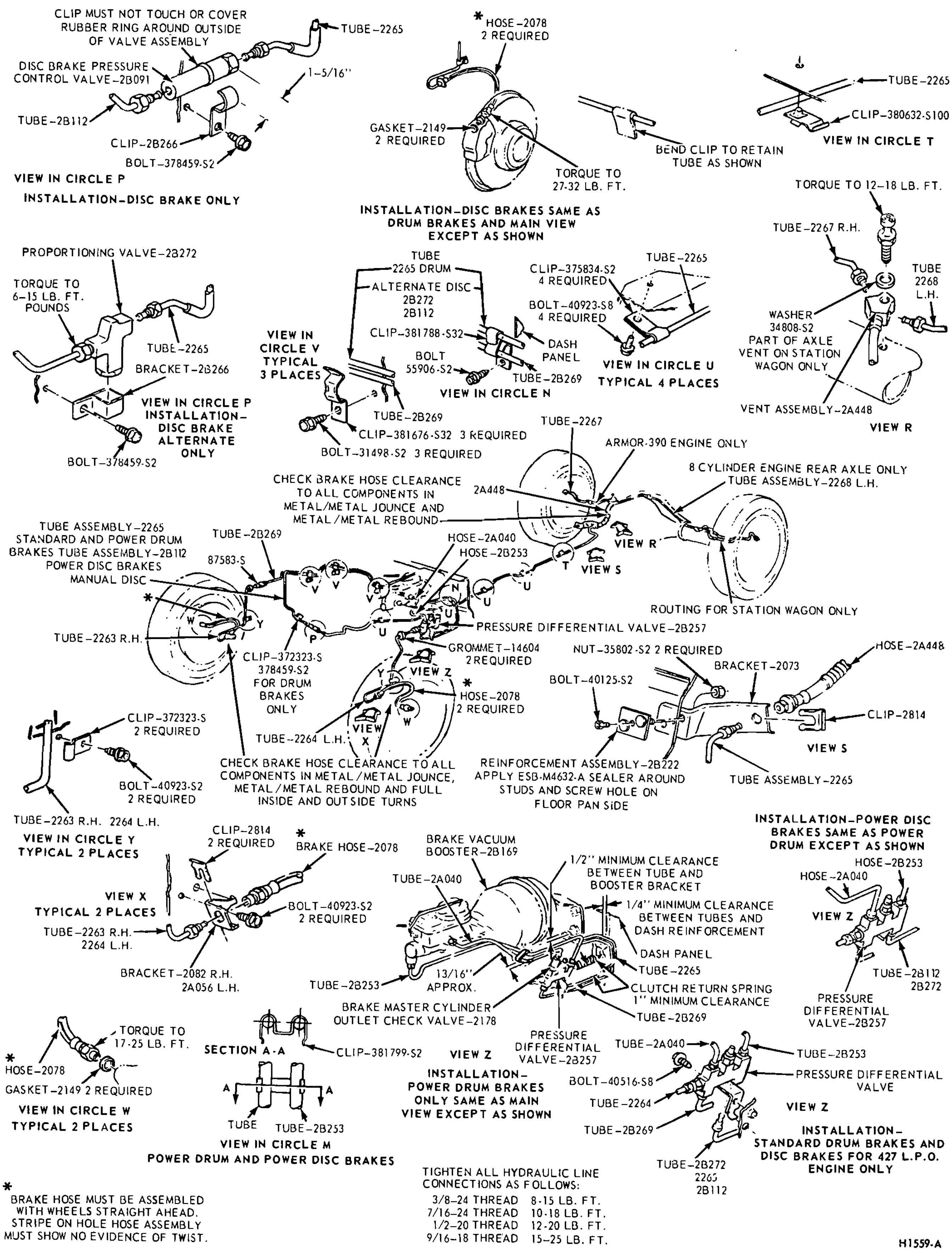


FIG. 20—Hydraulic Brake System—Comet—Fairlane and Falcon

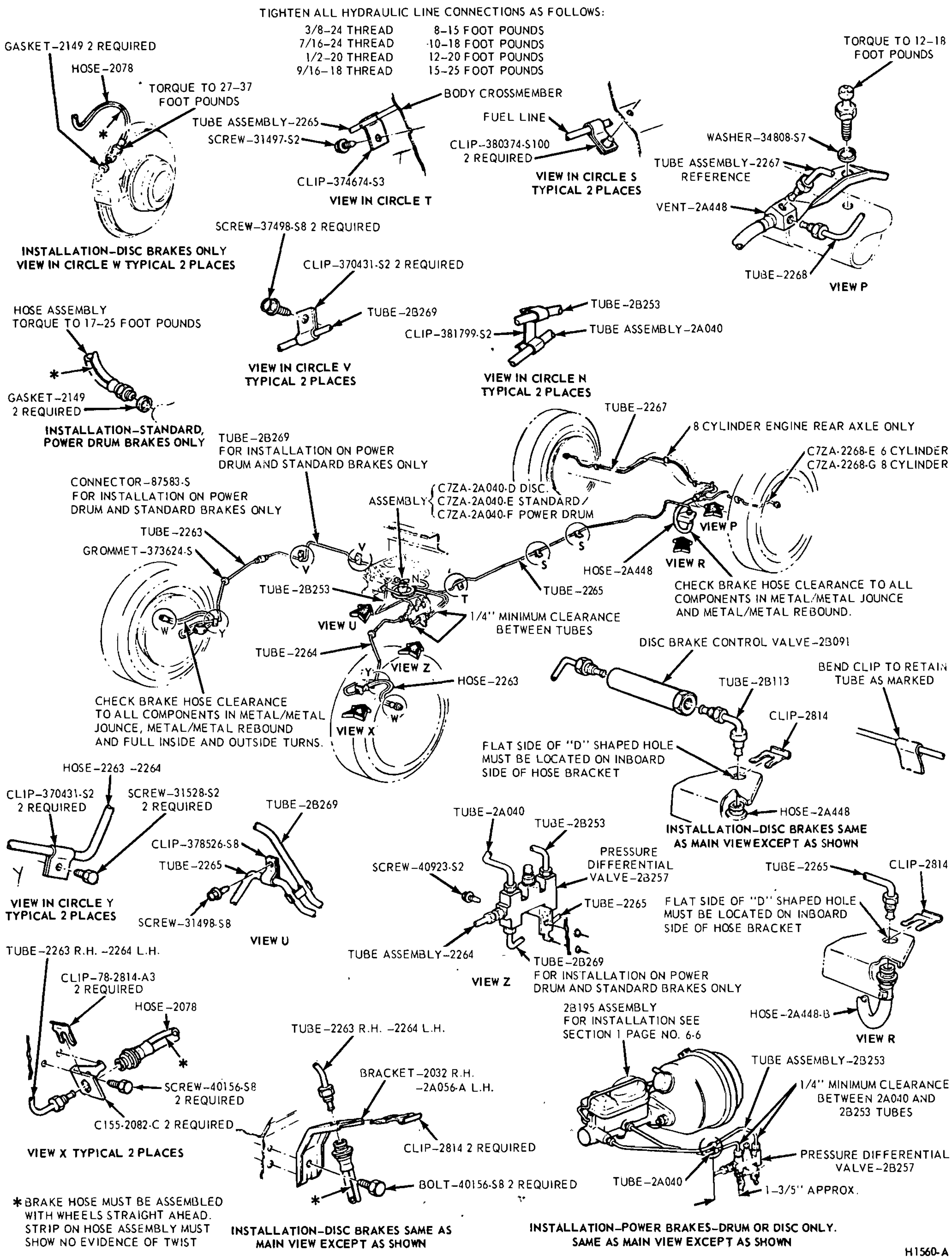


FIG. 21—Hydraulic Brake System—Mustang and Cougar

3 REMOVAL AND INSTALLATION

DUAL MASTER CYLINDER — STANDARD BRAKES

REMOVAL

Refer to Figs. 22 and 23.

1. Working from inside the vehicle below the instrument panel, disconnect the master cylinder push rod from the brake pedal assembly. **The push rod cannot be removed from the master cylinder.**
2. Disconnect the stoplight switch wires at the connector. Remove the hairpin retainer. Slide the stop light switch off the brake pedal pin just far enough to clear the end of the pin, then lift the switch straight upward from the pin. **Use care to avoid switch damage during removal.**
3. Slide the master cylinder push rod and the nylon washers and bushings of the brake pedal pin.
4. Remove the brake tubes from the primary and secondary outlet ports of the master cylinder.
5. Remove the lock nuts or screws that secure the master cylinder to the dash panel and lift the cylinder forward and upward from the car.

INSTALLATION

Refer to Figs. 22 and 23.

1. Position the boot on the push rod and secure the boot to the master cylinder. Carefully insert the master cylinder push rod and boot through the dash panel opening.
2. On Fairlane, Falcon or Comet models, position the master cylinder on the mounting studs on the dash panel. Install the lock nuts on the studs at the dash panel and torque them to specification.
3. On Mustang or Couger models, position the master cylinder on the dash panel. Install the retaining screws and torque them to specification. Coat the nylon bushings with SAE 10W oil. Install the nylon washer and bushing on the brake pedal pin.
4. Position the stop light switch on the brake pedal pin, install the nylon bushing and washer and secure them in position with the hairpin retainer.
5. Connect the wires at the stop light switch connector.
6. Connect the brake lines to the master cylinder leaving the brake line fittings loose.
7. Fill the master cylinder with the specified brake fluid to within 1/4 to 1/2 inch of the dual reservoirs. Use Rotunda Brake Fluid — Extra Heavy Duty — Part Number C6AZ-

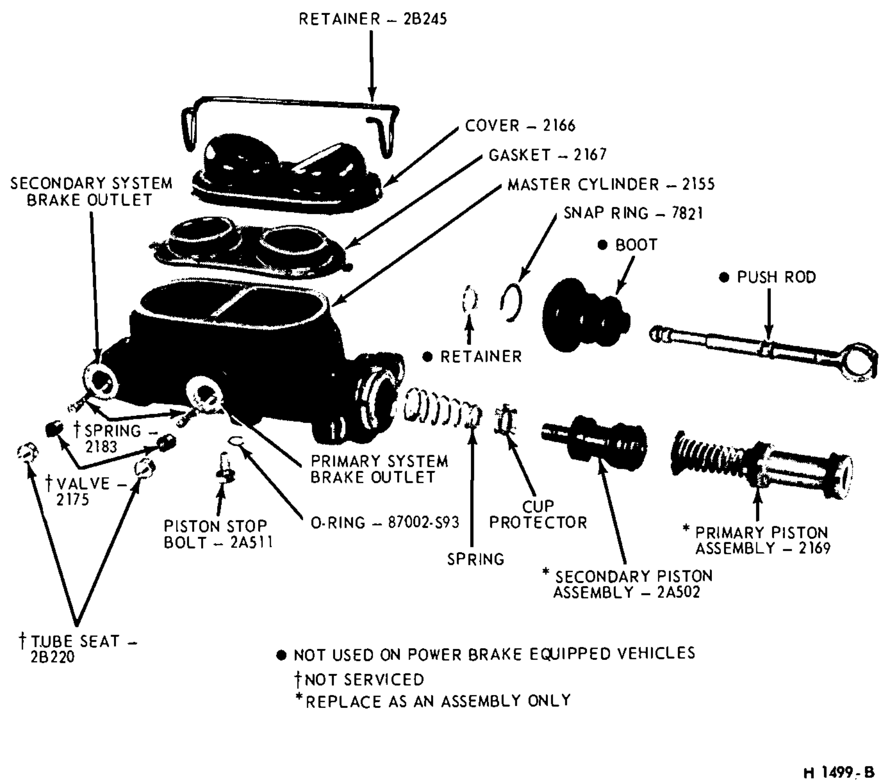


FIG. 22—Dual Master Cylinder Disassembled—Except Disc Brakes

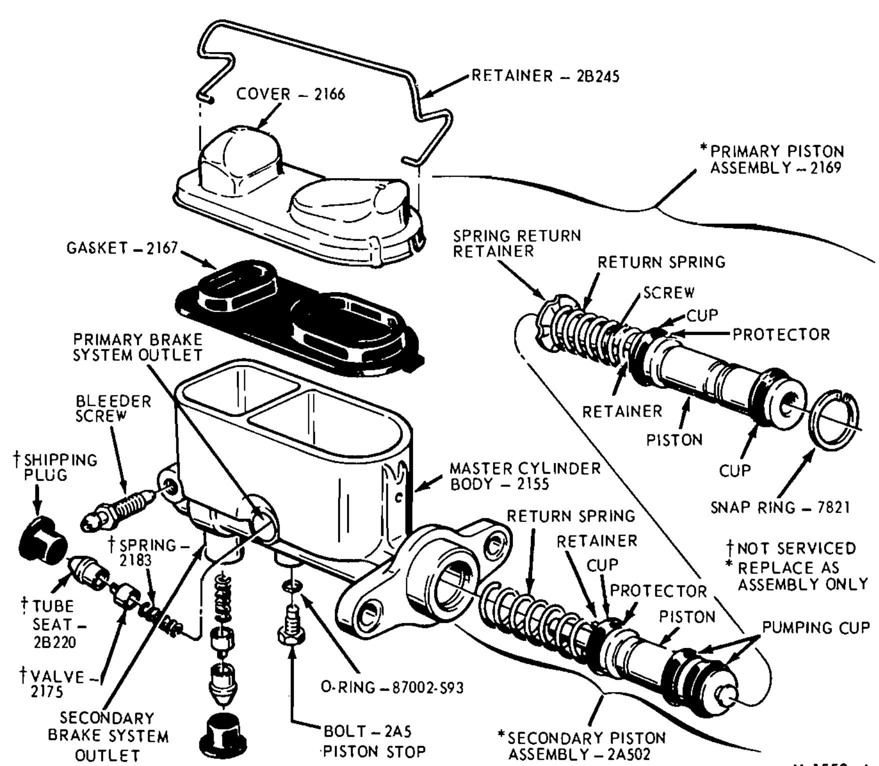


FIG. 23—Dual Master Cylinder Disassembled—Disc Brakes

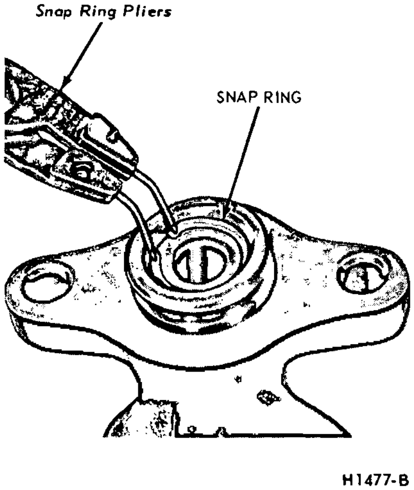


FIG. 24—**Removing Snap Ring—Typical**

19542-A (ESA-M6C25-A) for disc brake applications, and Rotunda Brake Fluid — Part Number B7AZ-19542-A, R 103-A or equivalent for power drum and standard brake applications. **The brake fluid is colored blue for identification. Do not mix low temperature brake fluids with the specified fluid for the power disc brake system.**

8. Bleed the dual-master cylinder and the primary and secondary brake systems. Centralize the pressure differential valve. Refer to Hydraulic System Bleeding and Centralizing of the Differential Valve, Part 2-1, Section 2 for the proper procedure.

9. Operate the brakes several times, then check for external hydraulic leaks.

DUAL MASTER CYLINDER — POWER BRAKES

Refer to Figs. 24 and 25.

REMOVAL

1. Remove the brake tubes from the primary and secondary outlet ports of the master cylinder.

2. Remove the two nuts attaching the master cylinder to the brake booster assembly.

3. Slide the master cylinder forward and upward from the vehicle.

INSTALLATION

1. Before installing the master cylinder, check the distance from the outer end of the booster assembly push rod to the master cylinder mounting surface. Turn the push rod adjusting screw in or out as required to obtain the specified length. Refer to Part 2-1, Section 2, Power Brake Master Cylinder Push Rod Adjustment for the proper procedure.

2. Position the master cylinder assembly over the booster push rod and onto the two studs on the booster assembly.

3. Install the attaching nuts and torque them to specifications.

4. Install the primary (front) and secondary (rear) brake tubes to the master cylinder outlet fittings, and torque them to specification.

5. Fill the master cylinder with the specified brake fluid to within 1/4 to 1/2 inch of the top of the dual reservoirs. Use Rotunda Brake Fluid — Extra Heavy Duty — Part Number C6AZ-19542-A (ESA-M6C25-A) for disc brake applications, and Rotunda Brake Fluid — Part Number B7AZ-19542-A, R 103-A or equivalent for power drum and standard brake applications. **The brake fluid is colored blue for identification. Do not mix low temperature brake fluids with the specified fluid for the disc brake system.**

6. Bleed the dual-master cylinder and the primary and secondary brake systems. Centralize the pressure differential valve. Refer to Hydraulic System Bleeding and Centralizing of the Differential Valve, Part 2-1, Section 2 for the proper procedure.

7. Operate the brakes several times, then check for external hydraulic leaks.

PRESSURE DIFFERENTIAL VALVE ASSEMBLY

Refer to Figs. 20 and 21.

REMOVAL

1. Disconnect the brake warning light wire from the pressure differential valve assembly switch. **To prevent damage to the brake warning switch wire connector, expand the plastic lugs to allow removal of the shell-wire connector from the switch body.**

2. Loosen the tube nut connecting the primary (front brake) system inlet tube at the top of the pressure differential valve assembly and disconnect the tube.

3. Disconnect the primary system left front brake outlet tube from the top side of the pressure differential valve assembly.

4. Disconnect the primary system right front brake outlet tube from the top side of the differential valve assembly.

5. Disconnect the secondary (rear brake) system inlet tube at the lower side of the pressure differential valve assembly.

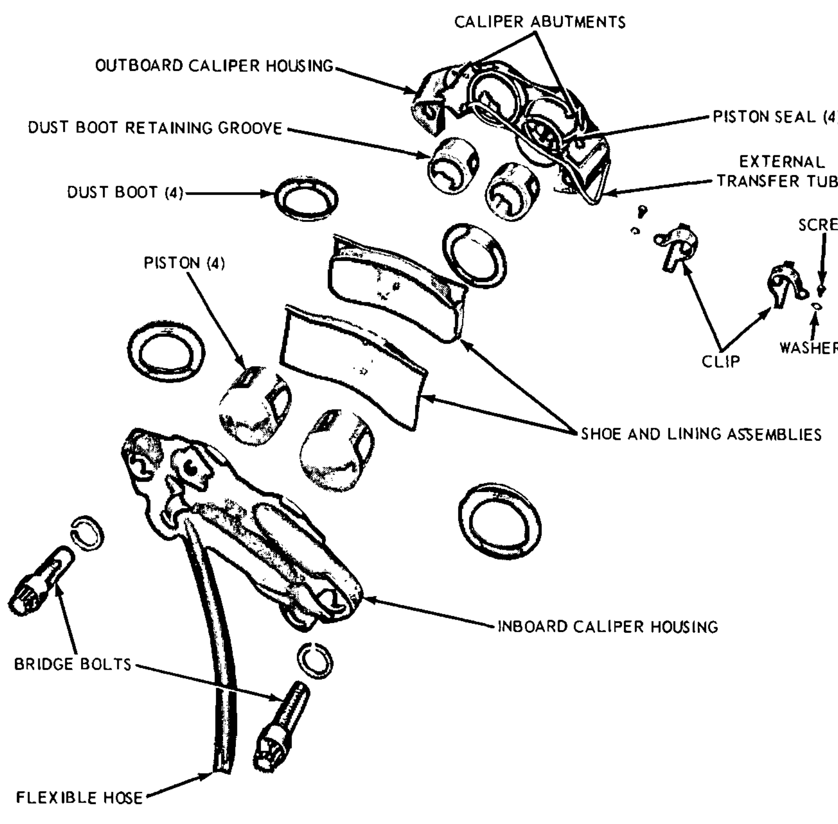


FIG. 25—**Caliper Assembly—Disassembled**

6. Disconnect the secondary system rear brake outlet tube from the lower side pressure differential valve assembly.

7. Remove the screw retaining the pressure differential valve assembly to the vehicle and remove the differential valve assembly.

8. If the differential valve is to be replaced, remove the brake warning lamp switch and install the switch in the new differential valve. **The pressure differential valve assembly and the brake warning lamp switch are separate units and each is serviced as a separate assembly only.**

9. On disc brake equipped vehicles, remove front wheel covers. Remove front wheel and tire assemblies.

INSTALLATION

1. Mount the pressure differential valve assembly on the vehicle and tighten the attaching screw.

2. Connect the rear brake system inlet tube to the pressure differential valve assembly and tighten the tube nut to the specified torque (Refer to Part 2-3).

3. Connect the rear brake system outlet tube to the pressure differential valve assembly. Tighten the tube nut to the specified torque.

4. Connect the front brake system inlet tube to the pressure differential valve assembly and tighten the tube nut to the specified torque.

5. Connect the right front brake outlet tube to the pressure differential valve assembly. Tighten the tube nut to the specified torque.

6. Connect the left front brake outlet tube to the pressure differential valve assembly. Tighten the tube nut to the specified torque.

7. Connect the shell-wire connector to the brake warning lamp switch. **Make sure the plastic lugs on the connector hold the connector securely to the switch.**

8. Bleed the brakes and centralize the pressure differential valve (Part 2-1, Section 2).

9. On disc brake equipped cars, install front wheel and tire assemblies, and torque the retaining nuts to specification. Install wheel covers.

BRAKE BOOSTER

Refer to Figs. 24 and 25.

REMOVAL

1. Working from inside the vehicle below the instrument panel, disconnect the booster push rod link from the brake pedal assembly. To do this, proceed as follows:

Disconnect the stop light switch wires at the connector. Remove the hairpin retainer. Slide the stop light switch off from the brake pedal pin **just far enough for the switch outer hole to clear the pin,** and then lift the switch straight **upward** from the pin. Be careful not to damage the switch during removal. Slide the master cylinder push rod and the nylon washers and bushing off the brake pedal pin.

2. Open the hood. Disconnect the master cylinder outlet front and rear tubes from the master cylinder and the differential valve. Remove the master cylinder from the booster. Secure it to one side without disturbing the hydraulic lines.

3. Disconnect the manifold vacuum hose from the booster unit. If the vehicle is equipped with an automatic transmission disconnect the transmission vacuum unit hose.

4. Remove the four bracket-to-dash panel attaching nuts or bolts. Remove the booster and bracket assembly from the dash panel, sliding the push rod link out from the engine side of the dash panel.

5. Remove the push rod link boot from the dash panel.

INSTALLATION

Refer to Figs. 24 and 25.

1. Install the push rod link boot in the hole in the dash panel.

2. On Falcon, Comet, Fairlane vehicles, mount the booster and bracket assembly to the dash panel by sliding the bracket onto the mounting studs and the push rod link in through the hole and boot in the dash panel. Install the bracket-to-dash panel attaching locknuts and torque them to specification.

3. On Mustang and Couger vehicles, mount the booster and bracket assembly to the dash panel by sliding the push rod link in through the hole and boot in the dash panel. Install the bracket to dash panel attaching bolts and torque them to specification. Connect the manifold vacuum hose to the booster. If the vehicle is equipped with an automatic transmission, connect the transmission vacuum unit hose.

4. Before installing the master cylinder, check the distance from the outer end of the booster assembly push rod to master cylinder surface. Turn the screw in or out to obtain the specified length. Refer to Part 2-1, Section 2, Power Brake Master Cylinder Push Rod Adjustment. Install the master cylinder and torque the retaining nuts to specifications.

5. Working from inside the vehicle below the instrument panel, connect the booster push rod link to the brake pedal assembly. To do this, proceed as follows:

Apply a coating of SAE 10 engine oil to the bushings. Install the inner nylon washer, the master cylinder push rod, and the bushing on the brake pedal pin. Position the switch so that it straddles the push rod with the switch slot on the pedal pin and the switch outer hole just clearing the pin. Slide the switch completely onto the pin, and install the nylon washer. **Be careful not to bend or deform the switch.** Secure these parts to the pin with the hairpin retainer. Connect the stop light switch wires to the connector, and install the wires in the retaining clip.

6. Connect the master cylinder outlet front and rear tubes to the master cylinder and the differential valve. Torque the brake tube fittings to specification (Figs. 20 and 21). Bleed the brake system and centralize the pressure differential valve.

7. Check the brake booster for proper operation. Check the vacuum lines for leakage.

BRAKE PEDAL

REMOVAL—MANUAL SHIFT TRANSMISSION

1. On a Falcon, Comet or Fairlane, remove the clutch pedal assist spring.

On a Mustang, remove the pedal bumper and bracket assembly from the pedal support bracket to relieve the tension on the assist spring, and then remove the spring.

2. Disconnect the clutch pedal-to-equalizer rod at the clutch pedal by removing the hairpin type retainer and bushing.

3. Disconnect the stop light switch wires at the connector.

4. Remove the switch retainer, and slide the stop light switch off the brake pedal pin just far enough for the switch outer hole to clear the pin. Then lower the switch away from the pin.

5. Slide the master cylinder push rod and the nylon washers and bushing off from the brake pedal pin (Figs. 22 and 23).

6. Remove the self-locking pin and washer from the clutch and brake pedal shaft, then remove the clutch pedal and shaft assembly, the brake pedal assembly, and the bushings from the pedal support bracket (Figs. 22 and 23).

INSTALLATION

1. Apply a coating of SAE 10 en-

gine oil to the bushings and locate all bushings in their proper places on the clutch and brake pedal assemblies.

2. Position the brake pedal to the support bracket, then install the clutch pedal and shaft assembly through the support bracket and brake pedal assembly. Install the spring washer and retainer. (Fig. 22 and 23).

3. Install the split bushing in the spring groove of the clutch pedal. Hook the clutch assist spring to the groove and to the spring retainer.

4. Connect the clutch pedal to equalizer rod to the clutch pedal assembly with the bushing and the hairpin retainer. Apply SAE 10 engine oil to the bushing.

5. Install the inner nylon washer, the master cylinder push rod, and the bushing on the brake pedal pin. Position the switch so that it straddles the push rod with the switch slot on the pedal pin and the switch outer hole just clearing the pin. Slide the switch completely onto the pin, and install the outer nylon washer as shown in Fig. 23 and 23. Secure these parts to the pin with the self-locking pin.

6. Connect the stop light switch wires to the connector, and install the wires to the retaining clip.

7. Adjust the clutch pedal free play (Group 5) to specification, if required.

8. Check the Brake Pedal Free Height and Travel Measurements (Part 2-1, Section 1).

REMOVAL—AUTOMATIC TRANSMISSION

1. Disconnect the stop light switch wires at the connector.

2. Remove the self-locking pin and slide the stop light switch off the brake pedal pin **just far enough for the switch outer hole to clear the pin.** Then lower the switch away from the pin. Slide the master cylinder push rod and the nylon washers and bushing off from the brake pedal pin (Fig. 22 and 23).

3. Remove the self-locking pin and washer from the brake pedal shaft, then remove the shaft, the brake pedal assembly and the bushings from the pedal support bracket.

INSTALLATION

1. Apply a coating of SAE10 engine oil to the bushings and locate all the bushings in their proper places on the pedal assembly and pedal support bracket (Fig. 22).

2. Position the brake pedal assembly to the support bracket, then install the pedal shaft through the support bracket and brake pedal assembly. Install the washer and self-locking pin.

3. Install the inner nylon washer, the master cylinder push rod, and the bushing on the brake pedal pin. Position the switch so that it straddles the push rod with the switch slot on the pedal pin, and the switch outer hole just clearing the pin. Slide the switch completely onto the pin, and install the outer nylon washer as shown in Fig. 22. Secure these parts to the pin with the self-locking pin.

4. Connect the stop light switch wires to the connector, and install the wires in the retaining clip.

Check the Brake Pedal Free Height and Travel Measurements, Part 2, Section 1.

PARKING BRAKE CONTROL ASSEMBLY

REMOVAL—MUSTANG AND COUGAR

Refer to Fig. 26.

1. Remove the two screws and nuts that hold the control bracket on the instrument panel.

2. Remove the two nuts that secure the control to the dash panel.

3. Remove the hairpin clip and clevis pin that secures the pulley to the control handle assembly.

4. Disengage the locking pawl. Slide the rod forward and remove the ball on the cable from the slot on the control assembly. Remove the control from the vehicle.

INSTALLATION

1. Disengage the locking pawl. Slide the rod forward and connect the ball end of the cable to the slot in the control assembly and pull the rod rearward, engaging the pawl in the ratchet.

2. Assemble the pulley to the control handle and the clevis pin. Install the clevis retainer.

3. Position the assembly against the dash panel and instrument panel. Secure the assembly to the instrument panel with the two screws and nuts.

4. Working under the hood, install the two parking brake control to dash panel attaching nuts.

5. Check the parking brake for proper operation. Adjust the parking brake (Part 2-1, Section 2).

REMOVAL—FAIRLANE, FALCON AND COMET

Refer to Fig. 27.

1. Make sure the parking brake is completely released.

2. Remove the left cowl side (kick) panel. Disconnect the wire lead at the parking brake light switch.

3. Remove the rubber stop and the parking brake cable ball retainer. Disconnect the cable ball from the brake assembly.

4. Remove the parking brake light switch and the attaching screw.

5. Remove the three screws that attach the control assembly to the left cowl inner side panel.

6. Pull the control away from the cowl panel. Remove the hair-pin retainer securing the cable housing to the control assembly. Remove the control assembly.

INSTALLATION

1. Connect the ball-end of the parking brake cable to the control, and install the hair-pin retainer.

2. Position the control assembly to the cowl inner side panel and install the three attaching screws. Torque the screws to specification.

3. Position the parking brake light switch and install the attaching screw. Connect the switch wire lead.

4. Position the cable ball and install the nylon retainer and rubber stop.

5. Install the cowl side (kick) panel.

6. Check the operation of the parking brake switch and the parking brake. Adjust the parking brake, as required (Part 2-1, Section 2).

PARKING BRAKE EQUALIZER TO CONTROL CABLE

REMOVAL—MUSTANG AND COUGAR

1. Remove the attaching screws and insulator-bracket from the dash panel (Fig. 26).

2. Remove the parking brake control assembly and disengage the cable from the handle as outlined under Parking Brake Control in this section.

3. Pull the cable down through the hole in the dash panel.

4. Raise the vehicle on a hoist. Remove the hairpin retainer, and disengage the cable and conduit assem-

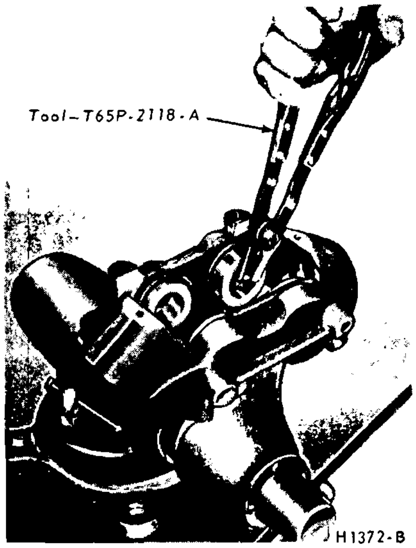


FIG. 26—**Removing or Installing Pistons**

bly from the bracket on the inner side rail.

5. Disconnect the cable stepped-rod from the equalizer lever. Pull the cable forward through the crossmember and remove the cable from the vehicle.

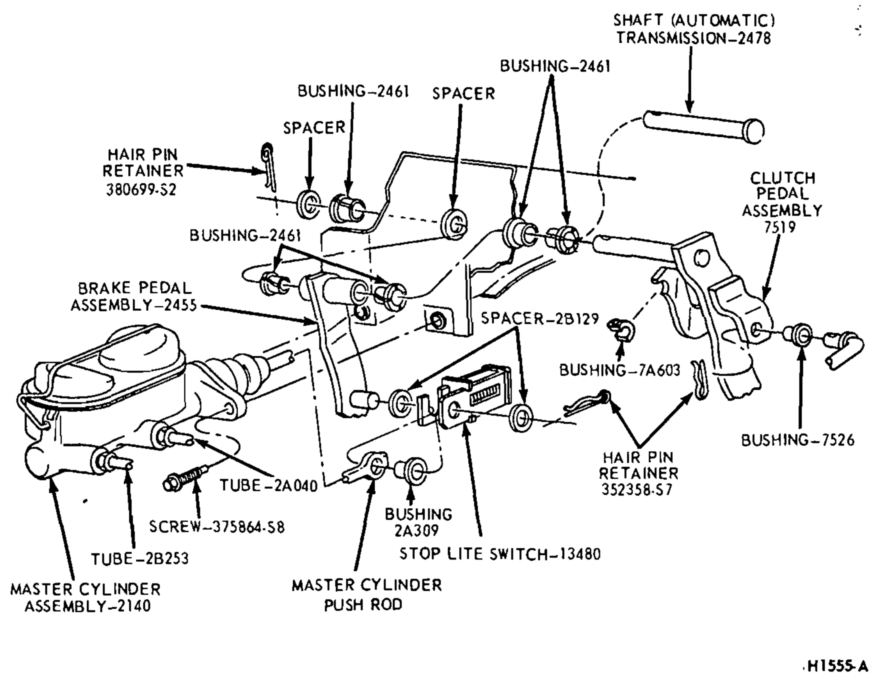


FIG. 27—**Dual-Brake System Master Cylinder Installation — Mustang and Cougar Without Power Brakes**

INSTALLATION

1. Pass the stepped-rod rearward through the crossmember and connect it into the equalizer lever.

2. Engage the cable and conduit assembly to the bracket on the inner side rail and secure with the hairpin retainer.

3. Push the upper end of the cable up through the hole in the dash panel.

4. Connect the cable upper ball to the parking brake control assembly, and install the control assembly as outlined in this section.

5. Position the cable insulator in the dash panel cable hole and secure the insulator to the dash panel with two attaching screws.

REMOVAL—FAIRLANE, COMET, FALCON

Refer to Fig. 27.

1. Working from inside the vehicle, position the floor cover back and remove the retaining screws securing the cable shield plate to the dash panel.
2. Position the parking brake in the **ON** position and remove the rubber stop and nylon cable retainer from the brake assembly.
3. Position the parking brake in the **OFF** position and remove the cable ball from the notch in the brake control assembly.
4. Remove the hairpin retainer and remove the cable housing from the brake assembly.
5. Raise the vehicle on a hoist. Remove the two nuts that attach the cable to the equalizer and spring. Remove the rear cable retainer, spring seat and spring.
6. Remove the hairpin retainer holding the cable housing to the body bracket and remove the cable assembly from the vehicle.

INSTALLATION

1. Position the cable housing through the opening in the floor and pull the cable grommet into position from under the vehicle.
2. Position the cable on the body bracket and install the hairpin retainer.
3. Position the spring, spring seat and the rear cable retainer. Install the two retaining (adjusting) nuts.
4. Lower the vehicle.
5. Connect the cable housing to the brake control assembly and install the hairpin retainer. Position the ball-end of the cable to the brake control assembly and install the nylon retainer and rubber bumper.
6. Position the cable shield plate to the dash panel and install the retaining screws. Position the floor covering.
7. Raise the vehicle and adjust the parking brake. Refer to Parking Brake Linkage Adjustment, Part 2-1, Section 2 for the proper procedure.
8. Lower the vehicle.

PARKING BRAKE EQUALIZER TO REAR WHEEL CABLE

A single cable passing through the equalizer and cable guides connects both parking brake assemblies on Comet and Fairlane station wagons and on Falcon vehicles. Separate cables for each parking brake are used on Mustang, Cougar, Comet and Fairlane passenger models.

FAIRLANE AND COMET PASSENGER MODELS

Removal

1. Remove the equalizer lock nut and adjusting nut, equalizer, spring and spring seat.

2. With the cables slack, disconnect the ball-ends from the connector (Fig. 27).

3. Remove the cable from the retainer hooks (station wagon models) and the underbody guide (convertible models) if required.

4. Remove the hairpin lock retaining the cable housing to the side rail bracket.

5. Remove the wheel cover, wheel and tire and the rear brake drum as outlined in Section 2.

6. Remove self-adjuster springs to allow clearance to remove cable retainer from the backing plate. Disconnect the rear end of the cable from the parking brake lever on the brake shoe. Disengage the cable housing retaining grommet or steel-pronged Hi-Hat from the backing plate and withdraw the cable and housing from the inboard side of the backing plate.

7. Slide the cable and housing out of the side rail bracket.

Installation

1. Insert the rear end of the cable through the side rail bracket and pull the cable and housing into position.

2. Insert the rear end of the cable and housing through the hole in the backing plate from the inboard side.

3. Connect the cable to the parking brake lever on the brake shoe and install the cable housing retaining grommet or steel-pronged Hi-Hat in the backing plate.

4. Install the self-adjuster springs. Position the cable housing in the side rail bracket and install the hairpin type retainer.

5. Install rear hub and drum assembly, wheel and tire assemblies and wheel cover as outlined in Section 2.

6. Position the cable retainer hooks (station wagon models) in the underbody guide (convertible models) and install the connector, thus hooking the two cables together.

7. Insert the cable into the equalizer and install the equalizer, spring seat, spring, adjusting nut and lock nut to the front, parking brake control cable.

8. Adjust the parking brake as directed in Part 2-1, Section 2.

FAIRLANE AND COMET STATION WAGONS AND FALCON PASSENGER MODELS

Removal And Installation

Generally follow the procedure given above, omitting separation of the cables, since the parking brake rear cable assemblies supplied for these models is in one piece. Removal and installation of both rear wheels, tires and drums will also be required.

MUSTANG AND COUGAR

Refer to Fig. 26.

Removal

1. Raise the vehicle on a hoist.

2. Position the parking brake in the OFF position.

3. Loosen the adjusting nut and remove rear parking brake cable ball end from the connector.

4. Remove the adjusting nut from the equalizer rod and remove the cable from the equalizer.

5. Remove the hairpin retainer securing the rear cable to the frame bracket. Remove the cable from the bracket.

6. Remove the wheel cover, wheel and tire, and rear brake drum as outlined in Section 2.

7. Remove the self-adjuster springs to allow clearance to remove the cable retainer from the backing plate. Disconnect the rear end of the cable from the parking brake lever on the brake shoe.

8. Disengage the cable housing pronged-retainer grommet from the backing plate and withdraw the cable and housing from the inboard side of the backing plate. Remove the cable from the vehicle.

Installation

1. On convertible models, insert the rear end of the cable through the underbody crossmember guide holes.

2. Insert the rear end of the cable and housing through the hole in the backing plate from the inboard side.

3. Connect the cable to the parking brake lever on the brake shoe, and securely install the cable housing pronged retainer in the backing plate.

4. Install the self-adjuster springs. Position the cable housing in the side rail bracket and install the hair pin type retainer.

5. Install the rear drum assembly, wheel and tire assemblies and wheel cover as outlined in Section 2.

6. Insert the cable ball ends in the connector. Position the equalizer on the equalizer rod. Insert the cable into the equalizer, and install the adjusting lock nut.

7. Adjust the parking brake as directed in Part 2-1, Section 2.

4 MAJOR REPAIR OPERATIONS

BRAKE DRUM REFINISHING

The 6-cylinder Falcon and Mustang models are equipped with 9-inch brake drums. All other models are equipped with 10-inch drums.

Minor scores on a brake drum can be removed with a fine emery cloth. A drum that is excessively scored or shows a total indicator runout of over 0.007 inch should be turned down. Remove only enough stock to eliminate the scores and true up the drum. The refinished diameter must not exceed 0.060 inch oversize.

If the drum diameter is less than 0.030 inch oversize 9.030 inches 6-cylinder Falcon or Mustang, or 10.030 inches on other models after refinishing, standard lining may be installed. If the drum diameter is more than 9.030 inches or 10.030 inches, oversize linings must be installed.

After a drum is turned down, wipe the refinished surface with a cloth soaked in clean denatured alcohol. If one drum is turned down, the opposite drum on the same axle should also be cut down to the same size.

ROTOR REFINISHING

Rotunda Disc Brake Attachment, FRE 2249-2, is the **only approved tool** to be used to refinish disc brake rotors. The step-by-step resurfacing procedure provided with the tool must be adhered to.

The finished braking surfaces of the rotor must be flat and parallel within 0.0007 inch; lateral runout

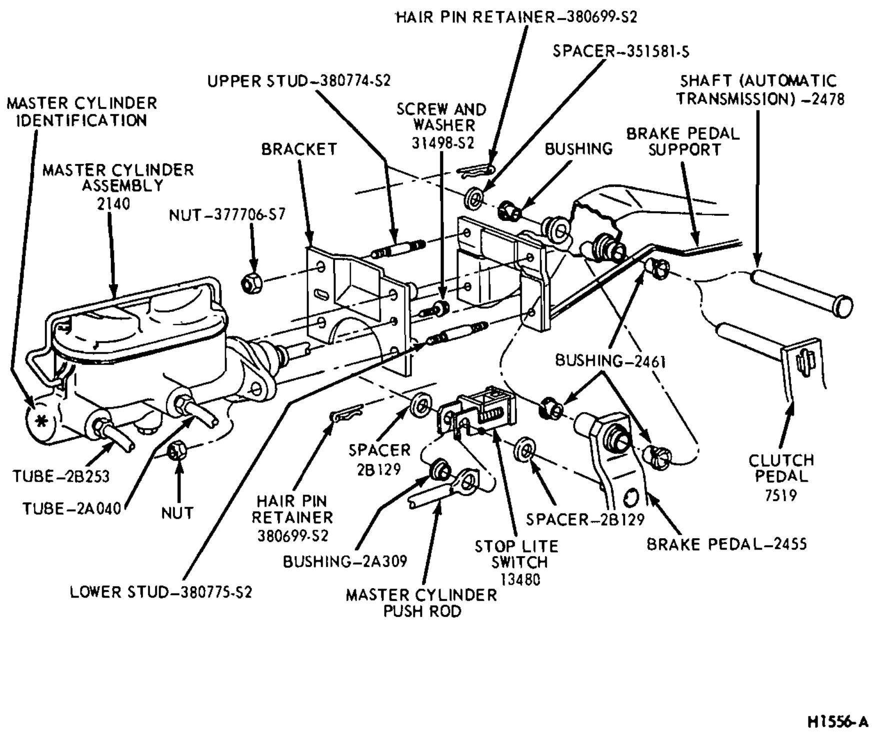


FIG. 28—**Dual-Brake System Master Cylinder Installation — Falcon, Fairlane and Comet Without Power Brakes**

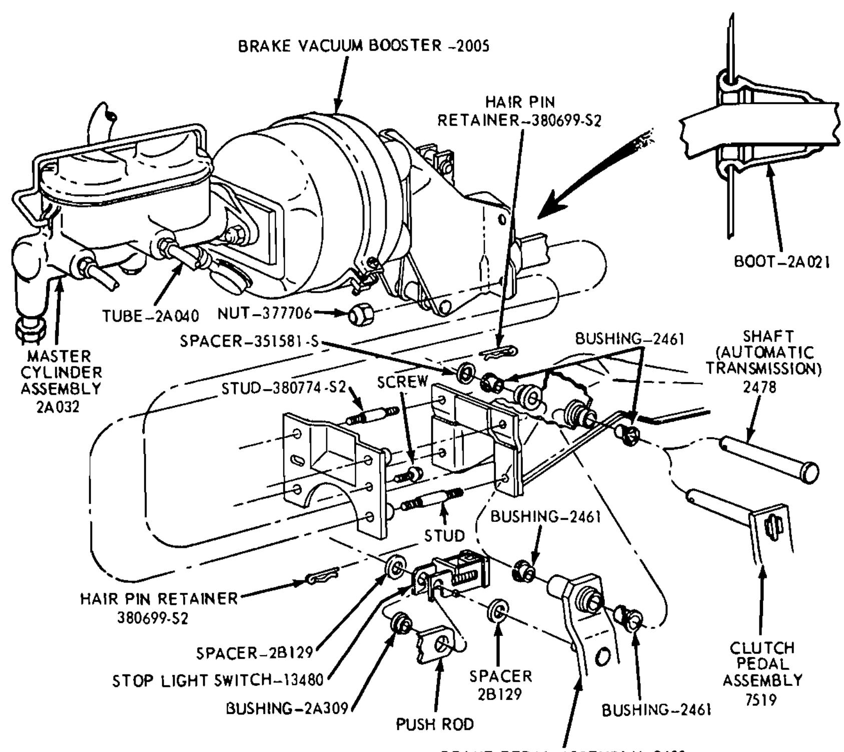


FIG. 29—**Vacuum Brake Booster Installation — Comet, Fairlane and Falcon**

must not exceed 0.002 inch total indicator reading, and the surface finish of the braking surfaces are to be 85/15 micro inches. The minimum limiting dimensions (Fig. 10, Part 2-1) from the inboard bearing cup to the outboard rotor face (dimension A) and from the inboard rotor face (dimension B) must be observed when removing material from the rotor braking surfaces.

BRAKE SHOE RELINING

Brake linings that are worn to within 1/32 inch of any rivet or have been contaminated with brake fluid, grease or oil should be replaced. Failure to replace worn linings will result in a scored drum. **When it is necessary to replace linings on one side, they must also be replaced on the wheel on the opposite side of the vehicle.**

Inspect brake shoes for distortion, cracks, or looseness. If this condition exists, the shoe must be discarded. **Do not repair a defective brake shoe.**

DUAL MASTER CYLINDER

DISASSEMBLY

1. Clean the outside of the master cylinder and remove the filler cover and diaphragm. Pour out any brake fluid that remains in the cylinder.
2. Remove the secondary piston stop bolt from the bottom of the cylinder (Figs. 28 and 29).
3. Remove the bleed screw, if required.
4. Remove the snap ring from the retaining groove at the rear of the master cylinder bore (Fig. 30). Remove the push rod and the primary piston assembly from the master cylinder bore. **Do not remove the screw that retains the primary return spring retainer, return spring, primary cup retainer, primary cup and protector on the primary piston. This assembly is factory pre-adjusted and should not be disassembled.**
5. Remove the secondary piston, pumping cups and protectors, primary cup, primary cup retainer and the secondary piston return spring. **Do not remove the outlet tube seats, outlet check valves and outlet check valve springs from the master cylinder body.**

INSPECTION AND REPAIR

1. Clean all parts in clean denatured alcohol, and inspect the parts for chipping, excessive wear or damage. Replace them as required. **When**

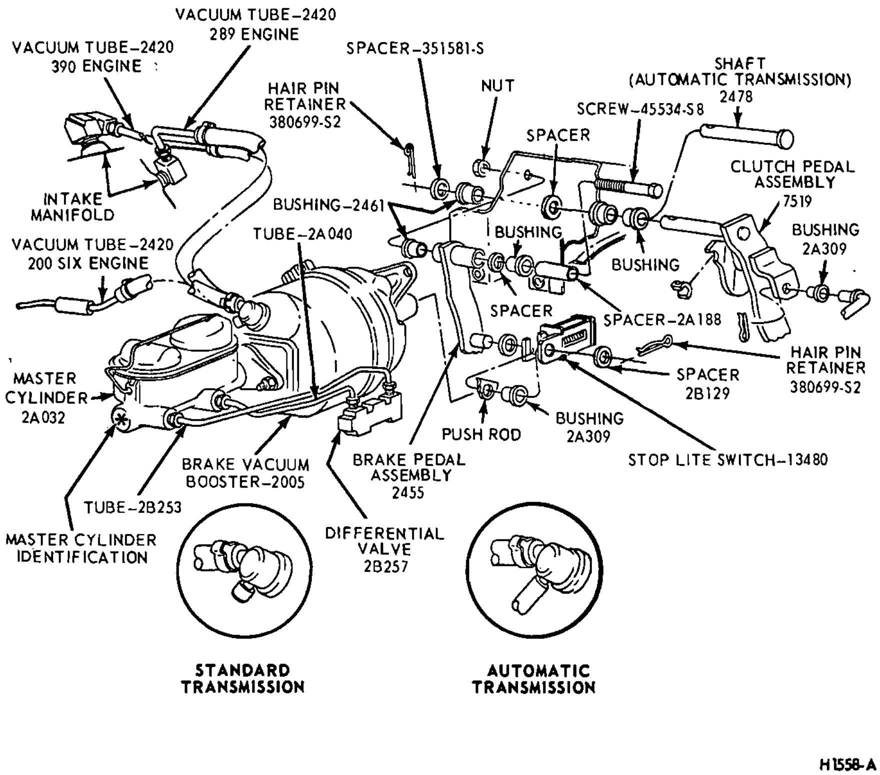


FIG. 30—Vacuum Brake Booster Installation — Mustang and Cougar

using a master cylinder repair kit, install all the parts supplied.

2. Check all recesses, openings and internal passages to be sure they are open and free of foreign matter. Use an air hose to blow out dirt and cleaning solvent. Place all parts on a clean pan or paper.

3. Inspect the master cylinder bore for signs of etching, pitting, scoring or rust. If it is necessary to hone the master cylinder bore to repair damage, do not exceed allowable hone specifications.

ASSEMBLY

1. Dip all parts except the master cylinder body in clean Rotunda Extra Heavy Duty Brake Fluid.

2. Install the seal and pumping cup on the secondary piston (Figs. 28 and 29). Install the protector and brake master cylinder primary cup on the secondary piston, then install the primary cup retainer and secondary piston return spring on the secondary piston. **Care must be taken to assure the protector is installed.**

3. Carefully insert the complete secondary piston and return spring assembly in the master cylinder bore.

4. Install the primary piston and return spring assembly in the master cylinder bore.

5. Install the push rod retainer on the push rod, if so equipped. Install the push rod assembly in the cylinder bore. **Make sure the retainer is properly seated and holding the push rod securely.**

6. Depress the primary piston and install the snap ring in the cylinder bore groove.

7. Position the inner end of the push rod boot (if so equipped) in the master cylinder body retaining groove.

8. Install the secondary piston stop bolt and gasket in the bottom of the master cylinder.

9. Install the bleed screw (if so equipped). Install the gasket (diaphragm) in the master cylinder filler cover. Position the gasket as shown in Figs. 28 and 29. **Make sure the gasket is securely seated.**

10. Install the cover and gasket on the master cylinder and secure the cover into position with the retainer.

DISC BRAKE CALIPER

DISASSEMBLY

Do not remove the bridge bolts that hold the two halves of the caliper together. The two caliper housings are shown separated in Fig. 31 for illustration purposes only.

1. Remove the caliper assembly from the vehicle as outlined in Section 2.

2. Remove the two attaching bolts and the caliper clips (Fig. 31).

3. Remove the two shoe and lining assemblies.

4. Remove the flexible brake hose from the caliper.

5. Remove the external transfer tube.

6. Clamp the caliper in a vise and secure it by the mounting flanges on the inboard housing (Fig. 32).

7. Remove the four pistons from the cylinder bores with the special tool shown in Fig. 32. The caliper pistons must be removed prior to removal of the dust boot. As the piston is withdrawn from the caliper, spread the dust boot back over the piston. To prevent cocking with consequent damage to the piston or bore, rotate the piston with the tool while pulling it outward at the same time. **Be careful to avoid scratching or damaging the outside diameter surface or dust boot. Such damage causes poor sealing.**

If a piston is so completely seized in the cylinder bore that it can not be removed with the special tool, force the cylinder out of the bore by positioning two screwdrivers in the piston dust boot retaining groove and prying outward. To prevent cocking, tap the end of the piston lightly around the circumference with a hammer, while the prying force is being applied. Be careful to avoid damaging the dust boot retainer in the caliper housing (Fig. 32). If this method of removal is used, the pistons must be replaced.

8. Remove the dust boots from the caliper assembly.

9. Remove the rubber piston seals from the grooves in the cylinder bores by carefully inserting the point of a small knife or other pointed instrument under the seal and raising the seal up far enough to be pulled out with the fingers.

CLEANING AND INSPECTION

Clean all metal parts with brake fluid or a suitable solvent (Fig. 32). Use clean, dry, compressed air to clean out and dry the grooves and passageways. Be sure that the caliper bore and component parts are completely free of any foreign material.

Check the cylinder bores and pistons for damage or excessive wear. Replace the piston if it is pitted, scored, or the chrome plating is worn off.

ASSEMBLY

1. Clamp the caliper in a vise and secure it by the mounting flange on the inboard housing.

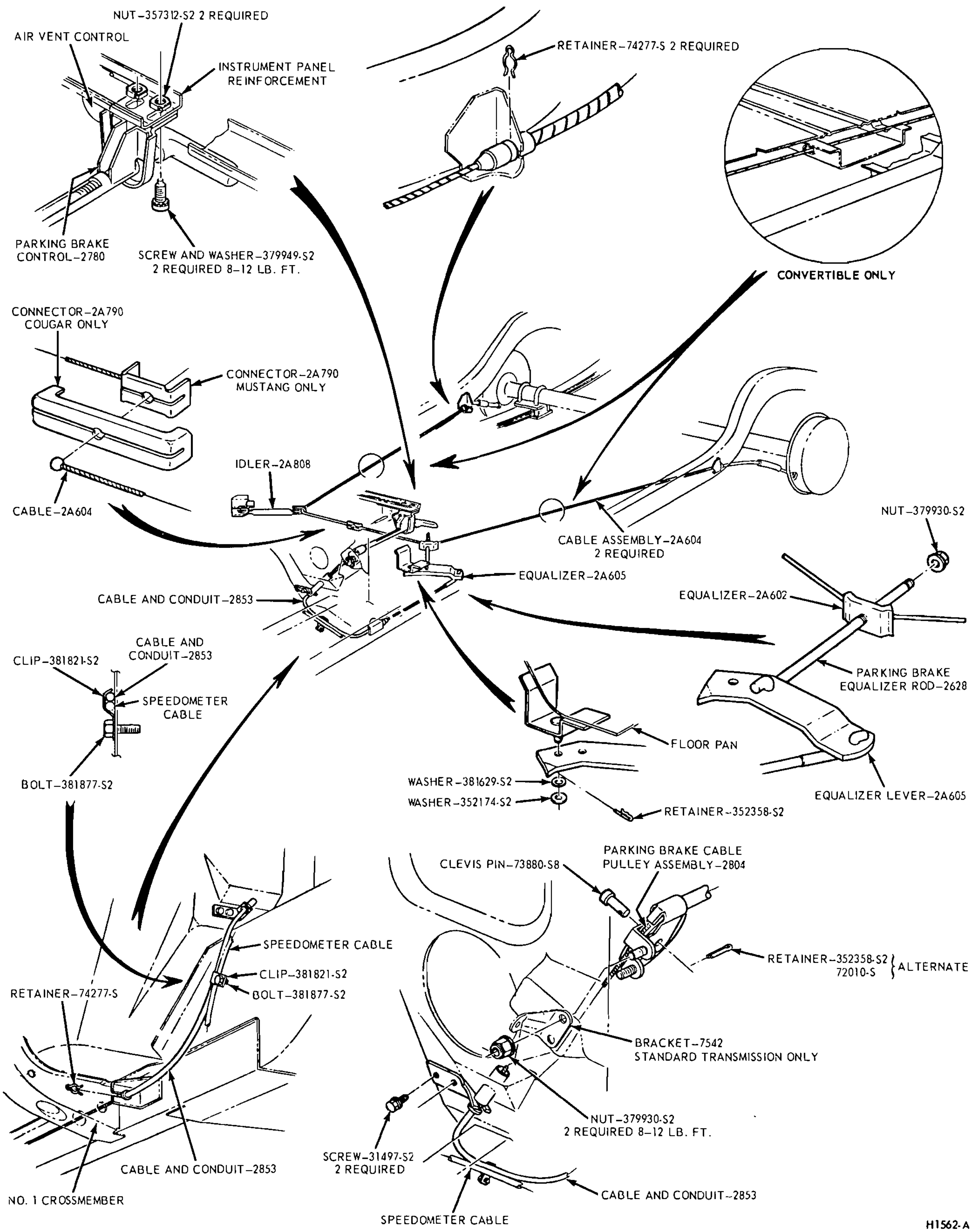


FIG. 31—Parking Brake Linkage — Mustang and Cougar

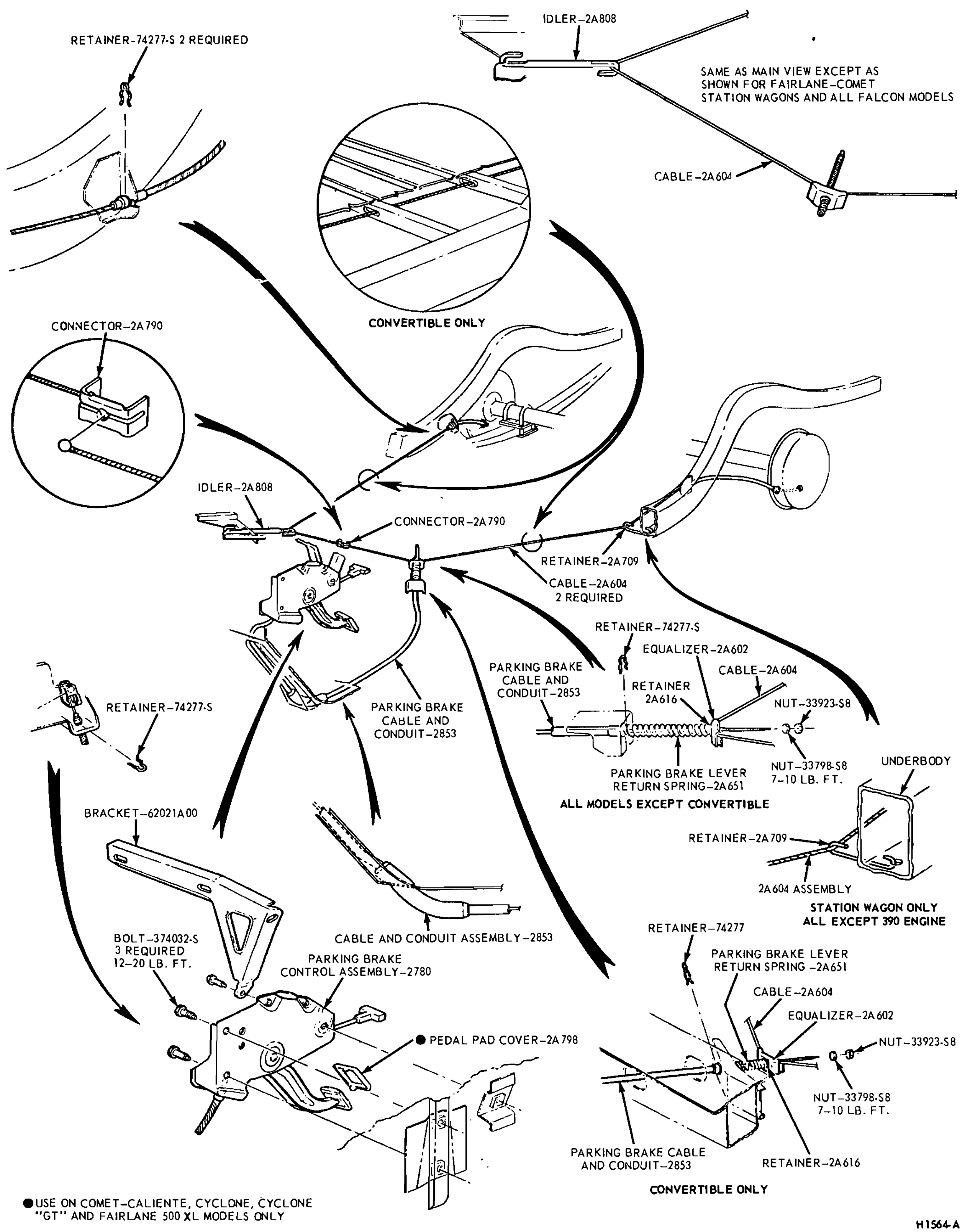


FIG. 32—Parking Brake Linkage—Fairlane, Falcon and Comet

2. The new caliper seals must be flat-round and not twisted when setting freely on a clean surface. Discard any new seals that have been deformed in shipping or storage. Installation of deformed seals may result in seal leakage.

3. Apply a film of clean brake fluid to new caliper piston seals and install them in the grooves of the cylinder bore. The seal should be positioned at one area in the groove and gently worked around. **Do not re-use the original seals.**

4. Install the new dust boots by seating the boot flange in the outer caliper bore groove. Position in one area and gently work around until fully seated. **Do not re-use the old dust boots.**

5. Coat the outside diameter of the pistons with brake fluid and install them in the cylinder bores so that the open end of the piston and the boot retaining groove face out of the bore. Spread the dust boot over the piston as the piston is being installed. To avoid cocking, locate the piston squarely in the bore and apply a slow steady pressure. If a piston will not easily go all the way into the bore, remove it and thoroughly inspect the cylinder bore, the piston seal and the installation of the seal. If the piston still will not go in with the bore in good condition and the piston seal properly installed, use the tool shown in Fig. 32. Rotate the piston with the tool while pushing it inward at the same time. Seat the dust boots carefully in the piston groove. Be sure that each boot is fully seated in their groove.

6. Install the external transfer tube.

7. Install a new gasket and the flexible brake hose to the caliper. Torque the hose connector to specification (Figs. 20 and 21).

8. Install the caliper assembly on the spindle, and install the shoe and lining assemblies and the splash shield as outlined in Section 2. Check the caliper for fluid leaks under maximum pedal pressures. **Do not move the car until a firm brake pedal is obtained.**

PART 2-3—Specifications

CHECKS AND ADJUSTMENT—INCHES

H1514-A

Description	Comet, Falcon, Fairlane	Cougar, Mustang
Brake Pedal Height and Travel Measurements	①	
Power Brake Push Rod Adjustment Bendix 0.980–0.995 Midland Ross 0.980–0.995	②	②
Lining Maximum Wear Limit (From Top of Rivets or Shoe Rim)	1/32	1/32
Lining Maximum Clearance to Shoe	0.008	0.008
Drum Diameter	10	10
Self Adjustment Cable Length— End Cable Anchor to End of Cable Hook	9 3/4 ③	9 3/4 ③

① Refer to Part 2-1, Section 1, Brake Pedal Free Height and Travel Measurements for the specifications and measurement procedures.

② 0.970–0.985 — Cougar, Mustang and Falcon Only

③ 8 13/32 6-Cylinder Falcon, Mustang

BORE DIAMETERS—BRAKE DRUM, WHEEL CYLINDER AND MASTER CYLINDER

H1512-A

Models		Brake Drum Inside Diameter	Brake Drum Boring Limit ① (Max.)	Wheel Cylinder Bore Dia. ② Front	Wheel Cylinder Bore Dia. ② Rear	Master Cylinder Bore Dia. With Power Brake ②	Master Cylinder Bore Dia. Less Power Brake ②
Comet and Fairlane	Pass. except Conv. (200 & 289 CID Engines)	10.000	10.060	1.125	0.906	③	1.000
	Pass. and Conv. (390 CID Engine)	10.000	10.060	1.094	0.875	③	1.000
	Convertible (Except 390 CID Engine)	10.000	10.060	1.094	0.906	③	1.000
	Station and Ranch Wagons (Except 390 CID)	10.000	10.060	1.094	0.938	③	1.000
Falcon	9 Inch Brake (200 CID Engine)	9.000	9.060	1.062 ④	0.844 ④	③	1.000
	10 Inch Brake — Station Wagon	10.000	10.060	1.094	0.938	③	1.000
	10 Inch Brake — Passenger Car	10.000	10.060	1.125	0.906	③	1.000
Mustang and Cougar	6 Cylinder — Mustang Only	9.000	9.060	1.062 ④	0.844 ④	1.000	1.000
	8 Cylinder — 390 CID Engine	10.000	10.060	1.094	0.813	1.000	1.000
	289 CID Engine	10.000	10.060	1.125	0.875	1.000	1.000

① Max. Runout 0.007

② Max. Allowable Hone 0.003

③ 0.9375 for Cars With Power Disc or Power Drum

④ Falcon and Mustang Front Wheel Cylinder on 6-Cyl. Cars, or Cars with 9 inch Brake, Cannot be Honed.

LINING DIMENSIONS—DRUM BRAKES—INCHES

H1513-A

Falcon	Position	Front	Rear	Color Code
Sedan and Hardtop 6-Cyl.	Primary	2.25 x 7.62	1.50 x 7.62	Red-Blue
	Secondary	2.25 x 9.77	1.50 x 9.77	Green
Station Wagon 6-Cyl.	Primary	2.50 x 8.43	2.00 x 8.43	Yellow-Black
	Secondary	2.50 x 10.82	2.00 x 10.82	Blue-Blue
Sedan and Hardtop 8-Cyl.	Primary	2.25 x 8.43	1.75 x 8.43	Yellow-Black
	Secondary	2.25 x 10.82	1.75 x 10.82	Blue-Blue
Station Wagon 8-Cyl.	Primary	2.50 x 8.43	2.50 x 8.43	Yellow-Black
	Secondary	2.50 x 10.82		Blue-Blue
Mustang And Cougar				
6-Cylinder	Primary	2.25 x 7.62	1.50 x 7.62	Red-Blue
	Secondary	2.25 x 9.77	1.50 x 9.77	Green
8-Cylinder (Except 390 CID)	Primary	2.25 x 8.43	1.75 x 8.43	Yellow-Black
	Secondary	2.25 x 10.82	1.75 x 10.82	Blue-Blue
8-Cylinder 390 CID	Primary	2.50 x 8.43	1.75 x 8.43	Yellow-Black
	Secondary	2.50 x 10.82	1.75 x 10.82	Blue-Blue

LINING DIMENSIONS—DRUM BRAKES—INCHES (CONTINUED) H1513-A1

Mustang and Cougar	Position	Front	Rear	Color Code
Comet and Fairlane				
Passenger Car (200 & 289 CID Engine)—Except Convertible	Primary	2.25 x 8.43	1.75 x 8.43	Yellow-Black
	Secondary	2.25 x 10.82	1.75 x 10.82	Blue-Blue
Passenger Car (390 CID Engine), Station Wagon and Convertible	Primary	2.50 x 8.43	2.00 x 8.43	Yellow-Black
(200 & 289 Engines), LPO Police—Max Fade Resistance	Secondary	2.50 x 10.82	2.00 x 10.82	Blue-Blue
Fairlane-Comet LPO Taxi—Maximum Wear	Primary	2.50 x 9.18	2.00 x 9.18	Red
Resistance (Bonded)	Secondary	2.50 x 10.82	2.00 x 10.82	White
Station Wagon (390 CID Engine)	Primary	2.50 x 8.43	2.50 x 8.43	Yellow-Black
	Secondary	2.50 x 10.82	2.50 x 10.82	Blue-Blue

SHOE AND LINING DIMENSIONS—DISC BRAKES—INCHES H1516-A

	Fairlane Comet, Falcon	Cougar Mustang
Lining Material	Bonded FoMoCo	Bonded FoMoCo
Lining Size	4.82 x 1.84	4.82 x 1.84
Lining Area-Square inches per Segment	8.500	8.500
Lining Thickness-Nominal	0.400	0.400
Lining Wear Limit (Front Surface of Shoe) — Max	0.030	0.030

CALIPER CYLINDER BORE DIAMETER -INCHES H1517-A

Mustang, Cougar, Falcon, Fairlane and Comet	1.636

ROTOR

Car Line	Thickness	Diameter Outside	Diameter Inside	Car Line	Thickness	Diameter Outside	Diameter Inside
Mustang, Cougar, Fairlane, Falcon, Comet					0.810	11.375	7.375
Rotor Runout—Maximum Allowable—.0025 for Mustang, Cougar, Fairlane, Falcon and Comet							

TORQUE LIMITS — DISC BRAKES (FT-LBS)

Description	Ft–Lbs	Description	Ft–Lbs
Caliper Assembly to Mounting Bracket	45–60 (And Safety Wire)	Hub and Rotor Assembly to Front Wheel Spindle	Rotate rotor while torquing to 17-25 ft-lbs. Back off the adjusting nut 1/2 turn and retighten to 10-15 inch pounds while rotating wheel. Selectively position nut retainer on adjusting nut so that a set of slots are in line with cotter pin hole. Adjusting nut should not be rotated in this operation. Lock adjusting nut and nut retainer with cotter pin so that the cotter pin end does not interfere with seating of wheel static collector in spindle hole.
Mounting Bracket to Spindle	35–45		
Caliper Bleeder Screw	10 Max (Must be leakproof)		
Caliper Brake Shoe Clips	7–9		
Caliper Bridge Bolts	75–105		
Rotor Splash Shield to Spindle	9–14		
Wheel Assembly to Front Wheel Hub and Rotor Assembly	75–110		
Brake Tube Fitting Nuts to Proportioning Valve	70 in-lbs (Max. Must be leakproof)		

TORQUE LIMITS (FT—LBS)—GENERAL

H1515-A

Description	Comet Fairlane	Falcon	Cougar Mustang
Parking Brake Control Assembly Mounting Bolt	15-20	15–20	15-20
Master Cylinder to Dash Panel Bolts	15-20	18–25	18-25
Brake Pedal Support Bracket to Instrument Panel	9-13	9–13	9-13
Wheel to Hub and Drum Nuts —			
4-Lug		55–85	55–85
5-Lug	70–115	70–115	70–115
Hydraulic Line Connections — Nut Sizes ①			
3/8–24		8–15	
7/16–24		10–18	
1/2–20		12–20	
9/16–18		15–25	
Brake Hose Connections Wheel Cylinder		17–25	
Caliper		27–32	
Front Brakes—Drum Type Backing Plate to Spindle Nut	28-42	28–42	28-42
Wheel, Hub and Drum Assembly to Wheel Spindle Nut	Rotate wheel and drum while torquing the wheel bearing adjusting nut to 17-25 ft-lbs torque. Back off the adjusting nut 1/2 turn and re-tighten to 10-15 inch pounds while rotating the drum and wheel Selectively position nut retainer on adjusting nut so that a set of slots are in line with cotter pin hole. Adjusting nut should not be rotated in this operation. Lock the adjusting nut and retainer with cotter pin so that cotter pin end does not interfere with seating of wheel static collector in spindle hole.		
Rear Brake—Drum Type Drum to Axle Shaft Speed Nut		Hand Push Fit	
Brake Cylinder to Brake Backing Plate Bolt	10–20	5–7 (9 inch brake) 10–20 (10 inch brake)	
Brake Backing Plate to Axle Housing 6-Cyl		30–40	
Brake Backing Plate to Axle Housing 8-Cyl		30–40	
Brake Line Connection to Axle Housing Bolt		12–18	12–18
POWER BRAKES: Master Cylinder to Booster Body	②	②	②
POWER BRAKES: Brake Booster to Pedal Support Bracket or Dash		18–25	18–25

① All hydraulic line connections (nuts) must be torqued to the specified value and free of fluid leakage

② Purchased as an assembly

SERVICE TOOLS

Ford Tool No.	Former No.	Description
Rotunda HRE 8650		Brake Adjusting Gauge
	LM-119	Brake Cylinder Retaining Clamp
	2018-A	Brake Adjusting Tool
	2162	Adapter Cap
	2035-N	Brake Shoe R & R Spring
TOOL 33621	33621	Internal Snap Ring Pliers
	Milbar 1112–144	Inch-lb torque wrench
TOOL 4235-C	4235-C	Axle Shaft Remover
Rotunda FRE 1431		Brake Drum Micrometer

Suspension, Steering, Wheels & Tires

GROUP 3

PART 3-1— *Suspension, Steering, Wheels, and Tires General Service*

1 DIAGNOSIS AND TESTING

MANUAL STEERING

Figs. 13 and 14 list various steering gear and linkage trouble symptoms and possible causes. Several of these symptoms are also common to suspension frame, and wheel and tire troubles. For this reason, be sure that the cause of the trouble is in the steering gear or linkage before adjusting, repairing, or replacing any of the steering parts.

When diagnosing tilt-away steering columns, refer to the diagnosis guide (Fig. 15) for the detailed information.

POWER STEERING

PRELIMINARY TESTS

The following preliminary checks should always be made before performing any trouble diagnosis operations.

Check Pump Belt

If the pump belt is broken, glazed, or worn, replace with a new belt. **Use only the specified type of belt.**

Check The Belt Tension

If the belt is too loose or too tight, it should be adjusted to the proper tension as outlined in Part 3-4.

A used belt is one that has run 15 minutes or longer.

Check Fluid Level

Start the engine, turn the steering wheel all the way to the left and right several times, and shut off the engine.

Check the fluid level in the reservoir. If the level is low, add enough fluid to raise the level to the full mark on the dipstick. **Do not overfill the reservoir.**

Check For Fluid Leaks

1. If the power steering fluid does not already include yellowish green dye, pre-mix one teaspoonful of oil-soluble aniline dye with 2 pints of automatic transmission fluid C1AZ-19582-A. Then refill the reservoir with the dye solution.

2. With the engine running at idle speed, turn the steering wheel all the way to the right stop and to the left stop several times to distribute the dye solution throughout the hydraulic system. Do not hold the wheel against each wheel stop for more than 3 to 5 seconds.

3. Shut off the engine, and check for leaks.

Fitting and Tube Seat Leak

Since most fluid leaks occur at the fittings and connections in a power steering hydraulic system, these parts should be checked before any other part is replaced.

1. With the engine running at idle speed, raise the vehicle on a hoist.

2. Clean the outside of the control valve and the power cylinder, the bottom surfaces of the pump, and all lines and fittings. Dirt, oil, and grease should be removed from all areas where leaks may exist.

3. Tighten all fittings, using a special 5-flat tube wrench. **Do not tighten the fitting with a standard open end wrench.** If a properly tightened fitting leaks, replace the seat.

Pump, Control Valve, and Power Cylinder Leak

If the fittings and connections do not leak, check the other parts of the system.

Check the hose connection at the pump for leaks, and tighten the hose clamp if necessary.

Pump Leaks

If leakage occurs at the pump reservoir seal, or pump outlet fitting seal, check the torque of the outlet valve nut. If torque is within specifications, replace the reservoir seal, and/or outlet valve seal, whichever is required if leaks are evident other than the lines.

Control Valve Leaks

If the control valve is leaking (somewhere other than the tube seats), replace all the seals, using a control valve seal kit. Use all the parts in the kit, and be sure they are correctly installed. When assembling the new seals in the valve, an application of silicone grease to the internal parts will help to provide a better seal against future leakage. Apply grease to the centering spring area, especially on the cap and spacer mating surfaces. Coat the threads of the cap retaining bolts with grease. The rubber boot seals, the actuator assembly, and the metal cup seals in the control valve should also be coated with silicone grease.

Some oil remaining from the manufacturing processes may be found in the sleeve near the ball stud. Do not confuse this oil with leaking fluid from the hydraulic system.

Power Cylinder Leaks

The power cylinder may leak at the piston rod seals. A power cylinder seal kit should be used to correct leakage. **Do not replace the power cylinder assembly unless the piston rod is scored or has a dull gray finish instead of a high luster chrome finish.**

Pump-Fluid Pressure Test

A fluid pressure test will show whether the pump or some other unit in the power steering system is causing trouble in the system. Steps outlined below should be followed to determine the cause of the trouble.

1. Measure the pump belt tension.

When adjusting the belt tension on the power steering pump, do not pry against the pump to obtain the proper belt load.

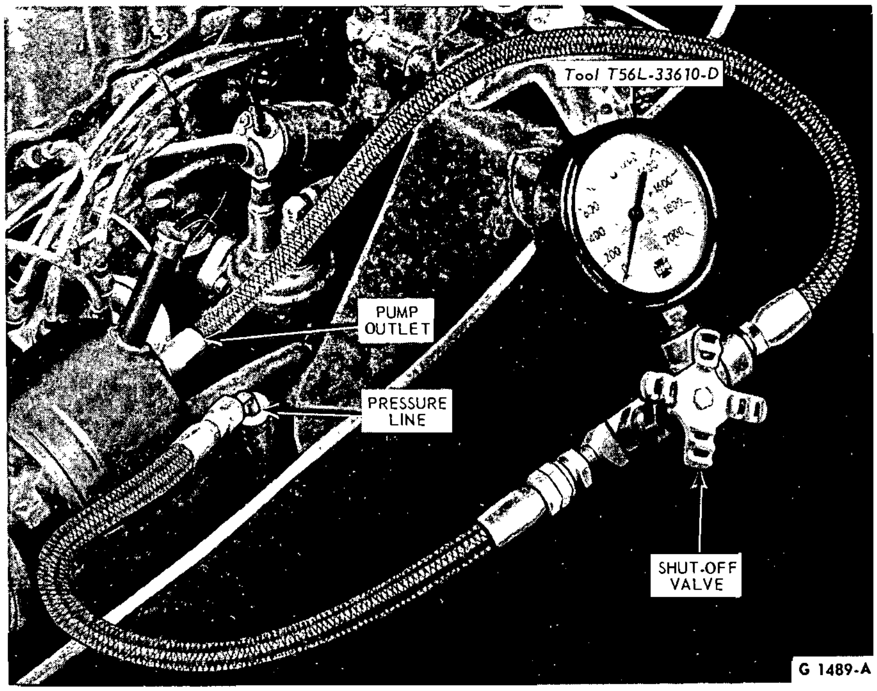


FIG. 1—Pressure Testing Tool Installed—Typical

On pumps used with a 6-cylinder engine, a half-inch cast boss has been incorporated on the front face of the pump cover plate onto which a 9/16 inch open end wrench can be fitted to pry the pump and obtain the proper belt tension. On pumps used with an 8-cylinder engine, apply leverage between the boss on the pump mounting bracket and the front face of the pump cover plate.

2. Disconnect the pressure line hose from the pump outlet, and install a 0-2000 psi pressure gauge and shut off valve between the end of the hose and the pump outlet (Fig. 1).

Be sure that the pressure gauge is between the pump and the shut off valve, all connections are tight, and the shut off valve is fully open.

3. Connect a tachometer.

4. Start the engine and operate it at idle speed for at least two minutes to warm up the fluid.

5. Cycle the steering wheel from stop-to-stop several times to expel any air from the system; stop the engine. Remove the reservoir filler cap and check the fluid level in the reservoir. If necessary, add fluid C1AZ-19582-A to the proper level.

6. With the engine running at **approximately** 500 rpm and no steering effort applied, and the fluid at normal operating temperature (160° - 180° F), the pressure gauge should show a pressure of less than **50** psi. If the pressure is higher, inspect the hoses for kinks and obstructions.

7. Increase the engine speed to 1000 rpm; then, slowly close the gauge shut-off valve. With the valve fully closed, the pump pressure should be 750 to 900 psi.

Do not close the valve for more than a few seconds (maximum 5 seconds), as this would abnormally increase the lubricant (fluid) temperature and cause undue pump and/or control valve wear. Engine rpm should not exceed fast idle during this test.

8. Remove the tachometer and the pressure testing gauge.

If pressure is more or less than specification, replace the pump assembly. If pressure is as specified and steering efforts are heavy, the gear and/or control valve could be at fault.

FRONT WHEEL ALIGNMENT CHECKS

Do not attempt to check and adjust front wheel alignment without first making a preliminary inspection of the front-end parts.

Check all the factors of front wheel alignment except the turning angle before making any adjustments. The turning angle should be checked only after caster, camber, and toe-in have been adjusted to specification.

The front wheel alignment specifications, given in Part 3-6 are correct only when the vehicle is at curb height. Before checking or adjust-

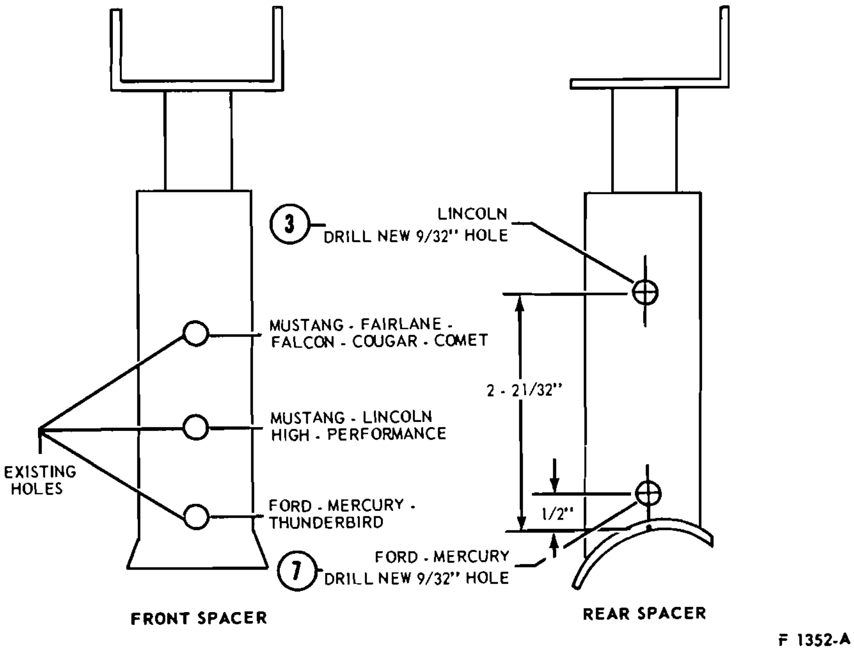


FIG. 2—**Alignment Spacers Modification**

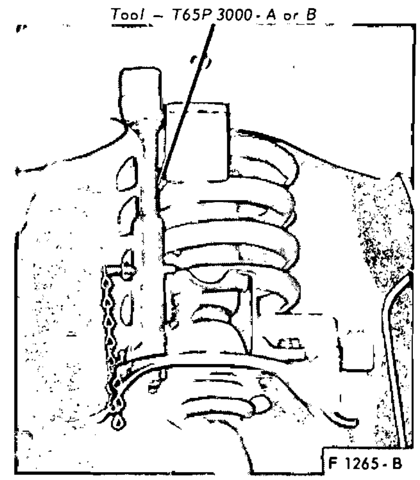


FIG. 3—**Typical Front Alignment Spacer Installation**

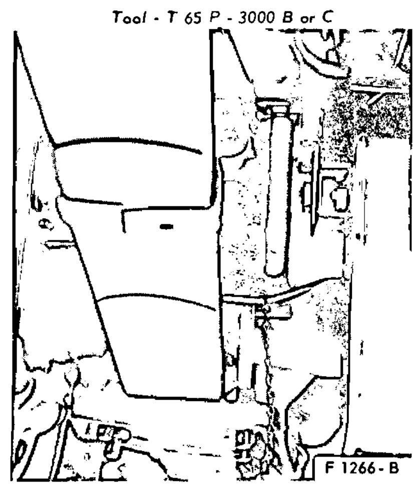


FIG. 4—**Typical Rear Alignment Spacer Installation**

ing the caster and camber, the suspension alignment spacers must be installed to obtain the curb heights.

FRONT SPACER

1. Mustang H.P., insert pin in second hole 1 13/16 inches from base (Fig. 2).
2. Falcon, Fairlane, Mustang, Cougar use pin in third hole, 2 1/2 inches from base.

REAR SPACERS

1. Falcon, Fairlane, Comet use hole 1 1/8 inches up from base.
2. Mustang and Cougar, do not use pin (Fig. 4).

EQUIPMENT INSTALLATION

Equipment used for front wheel alignment inspection must be accurate. Alignment height spacers (Figs. 3 and 4) are used to check caster, camber. The spacers should be omitted when checking toe-in.

1. Drive the vehicle in a straight line far enough to establish the straight-ahead position of the front wheels, and mark the steering wheel hub and the steering column collar (Fig. 5). **Do not adjust the steering wheel spoke position at this time.** If the front wheels are turned at any time during the inspection, align the marks to bring the wheels back to the straight-ahead position.
2. With the vehicle in position for the front end alignment inspection and adjustment, install the alignment spacers as follows to establish the curb height.

Insert the pin in the spacer hole marked for the model being checked (Mustang or Cougar rear does not use the pin).

Raise the front of the vehicle and position the alignment spacers between the suspension upper arm and the spring tower as shown in Fig. 3. The lower end of the spacer should be placed over the head of the ball joint front outside attaching rivet. Position the alignment spacers for the rear of the vehicle between the rear axle and the side rail as shown in (Fig. 4).

3. Install the wheel alignment equipment on the vehicle. Whichever type of equipment is used, follow the installation and inspection instructions provided by the equipment manufacturer.

CASTER

Check the caster angle at each front wheel.

Caster is the forward or rearward tilt of the top of the wheel spindle (Fig. 7). If the spindle tilts to the rear, caster is positive. If the spindle tilts to the front, caster is negative. The correct caster angle, or tilt, is specified in Part 3-6. The maximum difference between both front wheel caster angles should not exceed 1/2 However, a difference of not more than 1/4 ° is preferred.

CAMBER

Check the camber angle at each front wheel.

Camber is the amount the front wheels are tilted at the top (Fig. 6). If a wheel tilts outward, camber is positive. If a wheel tilts inward, camber is negative. The correct camber angle, or outward (positive) tilt, is specified in Part 3-6. The maximum difference between both front wheel camber angles should not exceed 1/2 However, a difference of not more than 1/4° is preferred.

TOE-IN

Alignment height spacers are not used to check and adjust toe-in. Toe-in should only be checked and adjusted after the caster and camber has been adjusted to specification.

Check the toe-in with the front

wheels in the straight-ahead position. **Run the engine so that the power steering control valve will be in the center (neutral) position (if so equipped).** Measure the distance between the extreme front and also between the extreme rear of both front wheels. The difference between these two distances is the toe-in.

Correct toe-in, or inward pointing of both front wheels at the front, is specified in Part 3-6.

FRONT WHEEL TURNING ANGLE

When the inside wheel is turned 20°, the turning angle of the outside wheel should be as specified in Part 3-6. The turning angle cannot be adjusted directly, because it is a result of the combination of caster, camber, and toe-in adjustments and should, therefore, be measured only after these adjustments have been made. If the turning angle does not measure to specifications, check the spindle or other suspension parts for a bent condition.

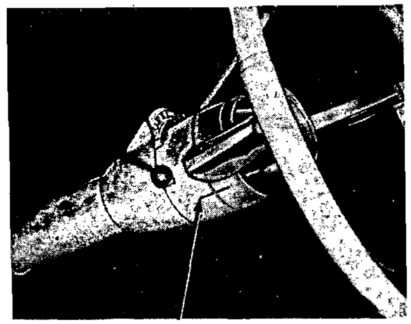


FIG. 5—Straight Ahead Position Marks— Typical

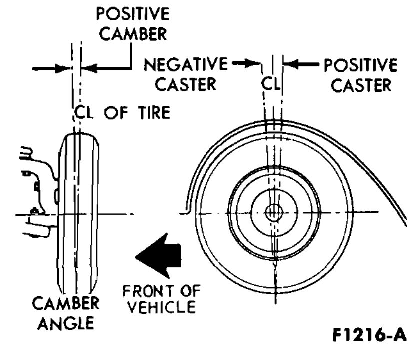


FIG. 6—Caster and Camber Angles

2 COMMON ADJUSTMENTS AND REPAIRS

After front wheel alignment factors have been checked, make the necessary adjustments. **Do not attempt to adjust the front wheel alignment by bending the suspension or steering parts.**

CASTER AND CAMBER ADJUSTMENTS

Be sure **all** the equipment listed in Equipment Installation is installed before adjusting the caster and camber.

Caster is controlled by the front suspension strut (Fig. 7). To obtain positive caster, loosen the strut rear nut and tighten the strut front nut against the bushing. To obtain negative caster, loosen the strut front nut and tighten the strut rear nut against the bushing.

Camber is controlled by the eccentric cam located at the lower arm attachment to the side rail (Fig. 7).

To adjust the camber, loosen the camber adjustment bolt nut at the rear of the body bracket (Fig. 7). Spread the body bracket at the camber adjustment bolt area just enough to permit lateral travel of the arm when the adjustment bolt is turned. Rotate the bolt and eccentric clockwise from the high position to increase camber or counterclockwise to decrease camber.

After the caster and camber has been adjusted to specification, torque the lower arm eccentric bolt nut and the strut front nut to specification.

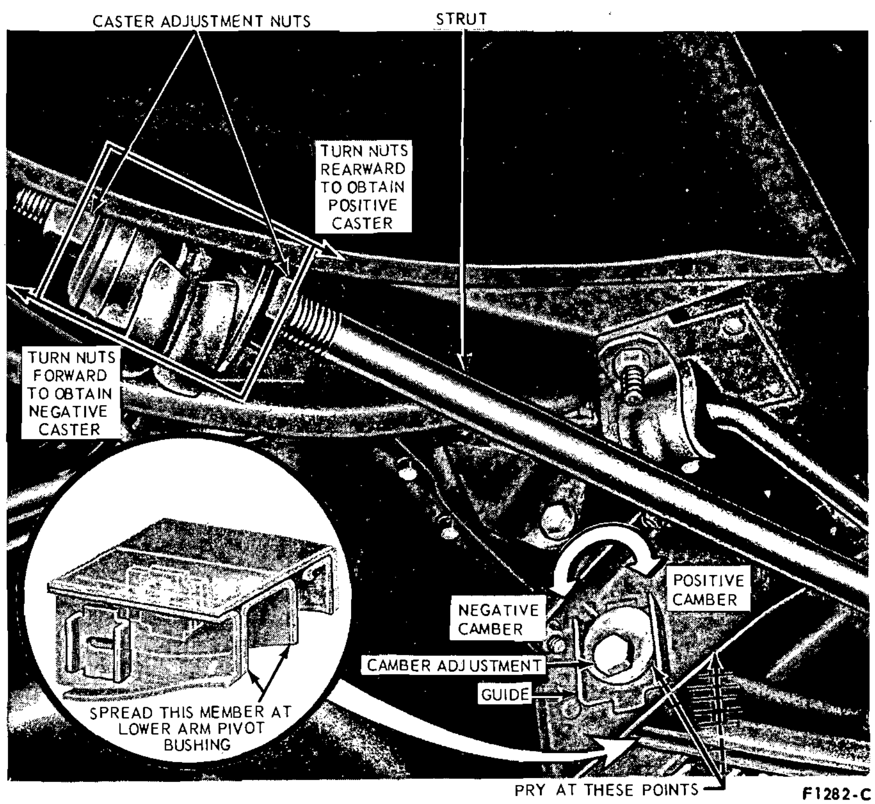


FIG. 7—Caster and Camber Adjustments— Comet, Falcon, and Fairlane

TOE-IN AND STEERING WHEEL ALIGNMENT ADJUSTMENTS

Check the steering wheel spoke position when the front wheels are in the straight-ahead position. If the spokes are not in their normal position, they can be properly adjusted while toe-in is being adjusted.

1. Loosen the two clamp bolts on each spindle connecting rod sleeve (Fig. 8).

2. Adjust toe-in. If the steering wheel spokes are in their normal po-

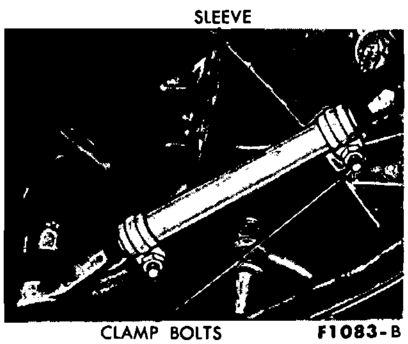


FIG. 8—Spindle Connecting Rod Sleeve— Typical

sition, lengthen or shorten both rods equally to obtain correct toe-in (Fig. 9). If the steering wheel spokes are not in their normal position, make the necessary rod adjustments to obtain correct toe-in and steering wheel spoke alignment (Figs. 10 and 11).

3. Recheck toe-in and steering wheel spoke alignment. If toe-in is correct and the steering wheel spokes are still not in their normal position, turn both connecting rod sleeves upward or downward the same number of turns to move the steering wheel spokes (Figs. 10 and 11).

4. When toe-in and steering wheel spoke alignment are both correct, oil the clamp bolts on both connecting rod sleeves and torque them to specification.

The sleeve clamp bolts should be facing forward.

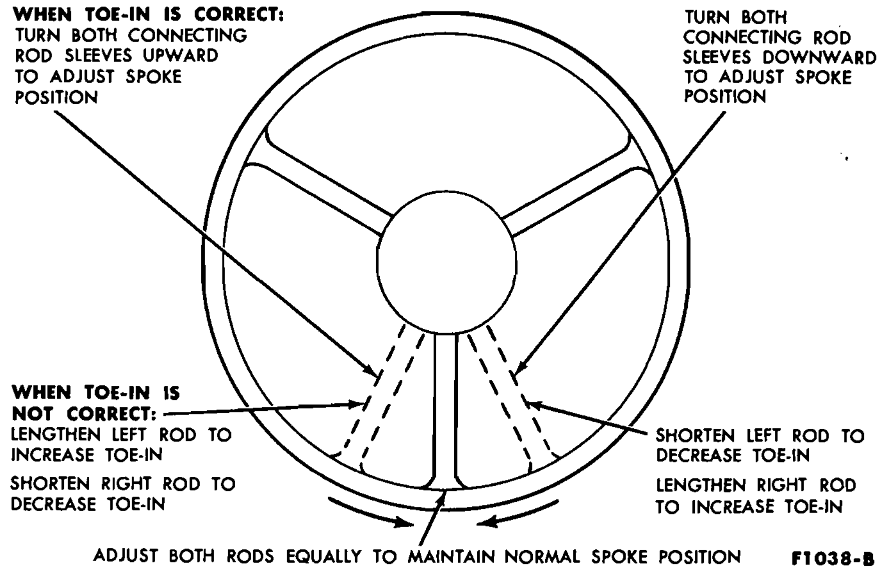


FIG. 11—Toe-In and Steering Wheel Spoke Adjustments—Mustang

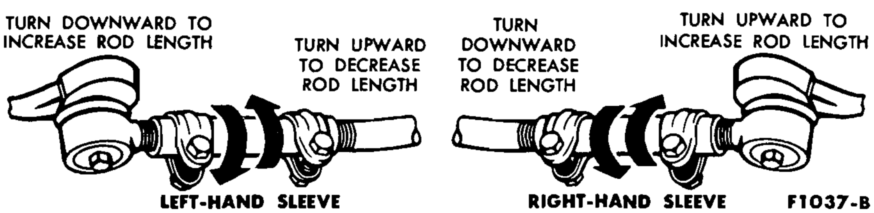


FIG. 9—Spindle Connecting Rod Adjustment

STEERING GEAR LUBRICANT CHECKING PROCEDURE

MUSTANG AND COUGAR

1. Center the steering wheel.
2. Remove the steering gear housing filler plug.
3. Remove the **upper** cover-to-housing attaching bolt.
4. With a **clean** punch or like instrument, clean out or push inward the loose lubricant in the filler plug hole and cover to housing attaching bolt hole.
5. Slowly turn the steering wheel to the **right** stop, lubricant should

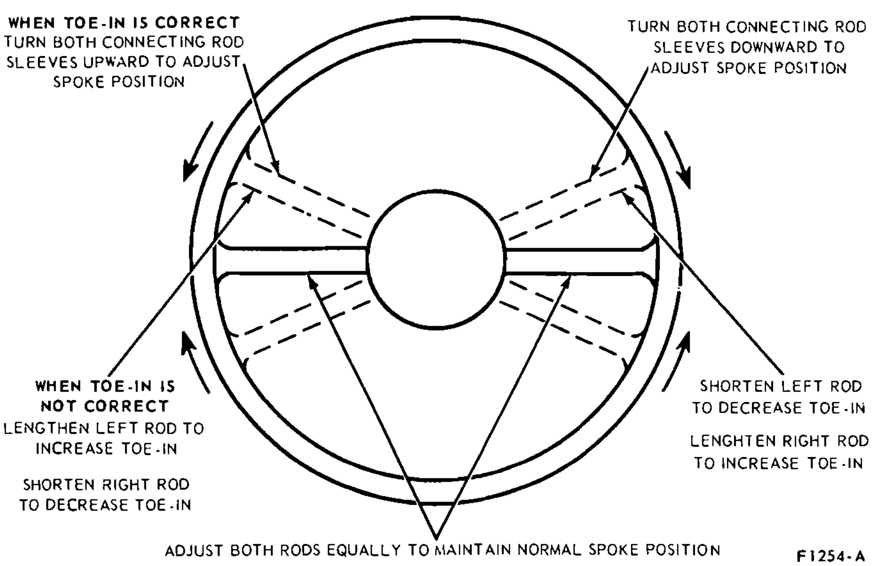


FIG. 10—Toe-In and Steering Wheel Spoke Adjustments—Comet, Falcon, and Fairlane

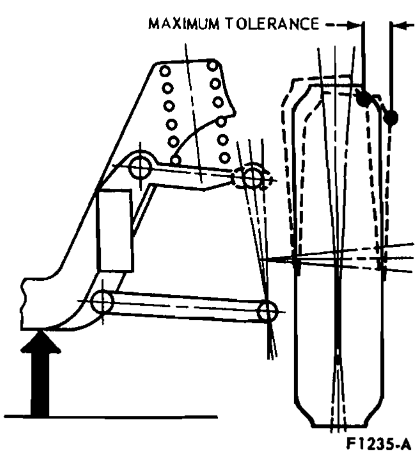


FIG. 12—Measuring Upper Ball Joint Radial Play

rise within the **upper** cover bolt hole; then slowly turn the steering wheel to the **left** stop, lubricant should rise within the filler plug hole. If lubricant does not rise in both the cover bolt hole and the filler plug hole, add lubricant until it comes out both holes during this check.

6. Install the upper cover-to-housing attaching bolt.

COMET, FALCON, AND FAIRLANE

1. Center the steering wheel.

2. Remove the steering gear housing filler plug for ventilation purposes.

3. Remove the lower cover-to-housing attaching bolt.

4. With a **clean** punch or like instrument, clean out or push inward the loose lubricant in the filler plug hole and cover to housing attaching bolt hole.

5. Slowly turn the steering wheel to the **left** stop, lubricant should rise within the lower cover bolt hole; then slowly turn the steering wheel to the **right** stop, lubricant should rise within the filler plug hole. If lubricant does not rise in both the cover bolt hole and the filler plug hole, add lubricant until it comes out both holes during this check. **On vehicles equipped with power brakes, the steering gear may be filled through the lower or upper cover bolt hole depending on vehicle usage. Steering wheel must be centered when filling gear with lubricant.**

6. Install the lower cover-to-housing attaching bolt and the filler plug.

3 CLEANING AND INSPECTION

STEERING GEAR CLEANING AND INSPECTION

Wash all parts except seals in a cleaning solvent and dry with a lint-free cloth. Seals must not be washed or soaked in cleaning solvent. **The bearing should not be spun dry with compressed air.** Inspect the shaft and worm for scoring, cracks or checks, and for straightness of the shaft. Check the splines and the threads on the sector shaft for wear and burrs. Inspect the gear teeth for scoring, pitting and other wear. Inspect the ball bearings for free movement, and the cups for wear or irregular surfaces. Check the housing for cracks and the sector shaft needle bearing for free movement or other wear.

POWER STEERING PUMP

If the pump has a visible leak, replace the reservoir seal, and/or outlet valve seal, whichever is required.

FLUSHING THE POWER STEERING SYSTEM

Should a power steering pump become inoperative, the shaft and pulley should be checked for freedom of rotation. If the pump shaft does not turn freely (binding), it is an indication that there is wear on the pump internal components and the need for flushing the steering system, when installing a new pump.

1. Remove the power steering pump and pulley as outlined in Part 3-4.

2. Install a new pump and connect only the pressure hose to the pump (Part 3-4).

3. Place the fluid return line in a suitable container and plug the resevoir return pipe.

4. Fill the reservoir with lubricant CIAZ-19582-A.

5. Disconnect the coil wire to prevent the engine from starting and raise the front wheels off the ground.

6. While approximately two quarts of fluid are being poured into the reservoir, turn the engine over using the ignition key, at the same time cycle the steering wheel from stop to stop.

7. As soon as all of the fluid has been poured in, turn off the ignition key, and attach the coil wire.

8. Remove the plug from the reservoir return pipe, and attach the return hose to the reservoir.

9. Check the reservoir fluid level; if low add fluid to the proper level. **Do not overfill.**

10. Lower the vehicle.

11. Start the engine and cycle the steering wheel from stop to stop to expel any trapped air from the system.

FRONT END GENERAL INSPECTION

Do not check and adjust front wheel alignment without first making the following inspection for front-end maladjustment, damage, or wear.

1. Check for specified air pressures in all four tires.

2. Raise the front of the vehicle off the floor. Shake each front wheel grasping the upper and lower surfaces of the tire to check the front suspension ball joints and mountings for looseness, wear, and damage. Check the brake backing plate mountings. Torque all loose nuts and bolts to specifications. Replace all worn parts as outlined in Part 3-2.

3. Check the steering gear mountings and all steering linkage connections for looseness. Torque all mountings to specifications. If any of the linkage is worn or bent, replace the parts as outlined in Part 3-3.

4. Check the front wheel bearings. If any in-and-out free play is noticed, adjust the bearing to specification (Part 3-5). Replace worn or damaged bearings as outlined in Part 3-5.

5. Spin each front wheel with a wheel spinner, and check and balance each wheel as required.

6. Check the action of the shock absorbers. If the shock absorbers are not in good condition, the vehicle may not settle in a normal, level position, and front wheel alignment may be affected.

WHEEL INSPECTION

Wheel lug nuts should be tightened to specification at the predelivery inspection. Loose wheel lug nuts may cause shimmy and vibration. Elongated stud holes in the wheels may also result from loose lug nuts.

Keep the wheels and hubs clean. Stones wedged between the wheel and drum and lumps of mud or grease can unbalance a wheel and tire.

Check for damage that would affect the runout of the wheels. Wobble or shimmy caused by a damaged wheel will cause permature tire wear and eventually damage the wheel bearings. Inspect the wheel rims for dents that could permit air to leak from the tires.

WHEEL BALANCING

See the instructions provided with the Rotunda Wheel Balancer.

UPPER BALL JOINT INSPECTION

1. Raise the vehicle on a frame contact hoist or by floor jacks placed beneath the underbody until the wheel

falls to the full down position as shown in Fig. 12. This will unload the upper ball joint.

2. Adjust the wheel bearings as described in Part 3-5.

3. Attach a dial indicator to the upper arm. Position the indicator so that the plunger rests against the underside of the spindle at the upper ball joint stud.

4. With the dial indicator attached to the upper arm, position the indicator so that the plunger rests against the inner side of the wheel rim adjacent to the upper arm ball joint.

5. Grasp the tire at the top and bottom, and slowly move the tire in and out (Fig. 12). Note the reading (radial play) on the dial indicator. If the reading exceeds specifications (Part 3-6), replace the upper ball joint.

LOWER BALL JOINT INSPECTION

1. Raise the vehicle on a frame contact hoist or by floor jacks placed beneath the underbody until the wheel falls to the full down position.

2. Ask an assistant to grasp the lower edge of the tire and move the wheel in and out.

3. As the wheel is being moved in and out, observe the lower end of the spindle and the lower arm.

4. Any movement between the lower end of the spindle and the lower arm indicates ball joint wear and loss of preload. If any such movement is observed, replace the lower arm.

During the foregoing check, the upper ball joint will be unloaded and may move. Disregard all such movement of the upper ball joint. Also, do not mistake loose wheel bearings for a worn ball joint.

SHOCK ABSORBERS

All vehicles are equipped with hydraulic shock absobers of the direct-acting type and are nonadjustable and nonadjustable and nonrefillable, and cannot be repaired.

Before replacing a shock absorber, check the action of the shock absorbers as follows:

ON VEHICLE TESTS

1. Check the shock absorber to be sure it is securely and properly installed. Check the shock absorber insulators for damage and wear.

Replace any defective insulators and tighten attachments to the specified torque (on a shock absorber which incorporates integral insulators, replace the shock absorber).

2. Inspect the shock absorber for evidence of fluid leakage. A light film of fluid is permissible. Be sure any fluid observed is not from sources other than the shock absorber.

Replace the shock absorber if leakage is severe.

3. Disconnect the one end of the shock absorber. Extend and compress the shock absorber as fast as possible, using as much travel as possible. Action should become smooth and uniform throughout each stroke. Higher resistance on extension than on compression is a normal condition. Faint swish noises are also normal.

Remove the shock absorber for a bench test if action is erratic. If the action is smooth, but the shock absorbers are suspected of being weak follow step 4:

4. Repeat step 3 on the mating shock absorber installed on the opposite side of the vehicle, and compare results of both tests. If the action is similar, it is unlikely that either shock absorber is defective. Reconnect both shock absorbers.

Replace the shock absorber having the lower resistance. Ensure that the part number of the replacement is the same as that of the original shock absorber. The replacement shock absorber resistance will appear to be higher than either original due to initial friction of the rod seal.

BENCH TEST

With the shock absorber right side up (as installed in vehicle), extend it fully. Then turn the shock absorber up side down and fully compress it. Repeat this procedure at least three times to ensure that any entrapped air has been expelled. Now place the shock absorber right side up in a vise, and hand stroke the shock absorber as described on On Vehicle Tests, step 3. If action is not now smooth and uniform, install a new shock absorber.

POSSIBLE CAUSES OF TROUBLE / TROUBLE SYMPTOMS	Jerky Steering	Loose Steering	Hard Steering and/or Loss of Power Assist	Hard Turning When Stationary	Steering and Suspension Noises	Shimmy or Wheel Tramp	Pull to One Side	Side-to-Side Wander	Body Sway or Roll	Tire Squeal on Turns	Binding or Poor Recovery	Abnormal or Irregular Tire Wear	Sag at One Wheel	Hard or Rough Ride	Rear Suspension Misalignment (Dog-Tracking)
1. Incorrect Tire Pressure			X	X		X	X	X	X	X	X	X	X	X	
2. Tire Sizes Not Uniform			X	X			X	X		X		X	X		
3. Overloaded or Unevenly Loaded Vehicle							X	X				X	X	X	
4. Power Steering Fluid Level Low-Leak	X		X	X	X										
5. Sagging or Broken Spring					X		X	X	X			X	X	X	
6. Glazed, Loose or Broken Power Steering Pump Belt	X		X	X	X						X				
7. Rear Spring Tie Bolt Off Center							X					X			X
8. Broken Rear Spring Tie Bolts					X	X	X	X	X			X			X
9. Rear Spring Front Hanger Mislocated							X					X			X
10. Bent Spindle Arm							X	X		X		X			
11. Bent Spindle							X	X		X		X			
12. Lack of Lubrication			X	X	X						X			X	
13. Air in Power Steering System	X		X	X	X	X									
14. Obstruction in Power Steering Lines			X	X	X						X				
15. Loose or Weak Shock Absorber					X	X		X	X			X		X	
16. Loose or Worn Suspension Arm Bushings					X	X						X		X	
17. Binding Front Suspension Ball Joints or Steering Linkage	X		X	X	X						X			X	
18. Loose, Worn, or Damaged Steering Linkage or Connections	X	X			X	X		X		X		X			
19. Loose Steering Gear Mountings	X	X			X	X		X							
20. Insufficient Steering Pump Pressure or Flow			X	X							X				
21. Incorrect Steering Gear Adjustment	X	X	X	X	X	X		X	X		X	X			
22. Incorrect Brake Adjustment	X				X		X		X		X	X			
23. Incorrect Front Wheel Bearing Adjustment	X	X			X	X	X	X				X			
24. Wheel Out of Balance	X					X						X		X	
25. Incorrect Front Wheel Alignment			X		X	X	X	X		X	X	X			
26. Out-of-Round Wheel or Brake Drum						X						X		X	
27. Frame or Underbody Out of Alignment							X					X			X
28. Bent Rear Axle Housing					X		X					X			X
29. Excessive Wear of Steering Pump Internal Parts			X		X										
30. Steering Control Valve Spool Binding or out of Adjustment			X	X			X				X				
31. Obstruction Within Steering Gear	X		X	X							X				

FIG. 13— Steering Trouble Symptoms and Possible Causes

BINDING OR POOR RECOVERY	If the steering wheel binds or sticks when turned, or if poor recovery to the straight-ahead position occurs, check for a loose or worn drive belt, then check the Pitman arm ball stud in the control valve sleeve. If the ball stud is rubbing against the edge of the sleeve slot, the roll pin may be missing. If either of the idler arm bushings are worn or damaged, replace both bushings. Check the steering gear adjustment Section 2). Check the operation of the control valve spool in the valve housing. If the spool is binding in the housing, check the spool adjustment. If the adjustment is correct, overhaul or replace the control valve. Check the control valve travel regulator stop adjustment. If the stop is drawn up too tightly, the ball stud will bind in the seats. Adjust the stop as required. Check the control valve sleeve and the socket tube for damage. Replace parts that show signs of damage, and adjust the travel regulator stop. Check for possible interference between the steering wheel and the steering column.
HARD STEERING	If the effort required to turn the steering wheel is greater than normal for the entire travel of the front wheels, check the tire pressure then, test the fluid pressure. Be sure that there are no leaks, that the reservoir is properly filled, and that the belt is properly adjusted and not worn. If the pump output pressure is low, the pump may be defective and should be replaced. If the pressure test shows that the trouble is in the control valve or power cylinder, remove and inspect these units. Repair or replace any damaged parts. If the pressure test indicates that the pressures throughout the system are within specifications, check the following items in the order given: Check the control valve spool centering spring adjustment. Adjust if required (Section 2). Check the control valve spool for movement. If the spool does not move freely, check for, and eliminate, interference between the socket tube and the valve sleeve. If the spool is sticking in the housing, remove the spool and check the spool lands for burrs. Small burrs may be removed with crocus cloth if the edges of the valve lands are not rounded in the process. If the spool cannot be repaired, replace the control valve. Check the control valve ball stud for free movement in the ball stud seats. If the stud is binding in the seats, adjust the travel regulator stop. If the hard steering still persists, check the front end alignment.
EXCESSIVE FREE PLAY	If excessive free play or lost motion is noticed when steering, check the steering gear preload and mesh adjustment. Check for excessive clearance between the steering arm ball stud and the ball stud seats. If the ball stud is loose in the seats, adjust the control valve travel regulator stop. Check the control valve centering spring adjustment. If the spring adjustment nut is loose, tighten the nut until it is snug, and then back off the nut not more than 1/4 turn. **Excessive tightening may damage the stop pin.**
NOISE	Check the pump belt for being worn or loose. A loose or glazed belt can cause belt squeal. A glazed belt, even when properly adjusted, may slip. Excessive torque at the pressure line joints may distort the tube seats and cause noise. Noise may result if the specified hose is not used or if it is improperly routed. If noise still exists with the specified hose properly installed and routed, the pump should be replaced.
STEERING CHATTER	A loose or worn pump belt or air in the fluid can cause chatter against the wheel stops during an extremely sharp turn. Check the belt tension, and adjust it to specifications or fill the reservoir if necessary. Check for looseness in the idler arm rod connection. Looseness at this point may be due to worn mounting bushings or improper mounting nut torque. Replace the bushings if worn. Torque the nut to specification. Check the power cylinder piston rod insulators for looseness. If the insulators are worn, replace them. If the mounting nut is loose, torque it to specification, and torque the locknut to specification.

FIG. 14—Steering Trouble Symptoms and Possible Causes

RATTLES	Check the control valve spool centering spring adjustment. If the adjustment is loose, tighten the nut until snug, and then back off the nut not more than 1/4 turn. **Excessive tightening may damage the stop pin.** Check for looseness between the control valve ball stud and the ball stud seats. If the stud is loose in the seats, adjust the travel regulator stop.
LOSS OF POWER ASSIST	Check the entire system for damage, replacing parts as necessary. Tighten a loose pump belt. Test the fluid pressure to determine whether the trouble is in the pump, the control valve, or the power cylinder. If the pressure test indicates that the pump is at fault, replace the pump. If the pressure test indicates that the control valve or power cylinder is at fault, check as follows: Disconnect the power cylinder piston rod from the idler arm bracket. Operate the piston by hand to check for resistance to movement. If the piston moves easily with little or no resistance, the internal parts of the power cylinder are broken or damaged. Replace the power cylinder if broken or damaged. Maladjustment of the control valve spool centering spring can cause a loss of either right or left power assist. Check the adjustment, and readjust if necessary. Replace all defective parts. Check the operation of the control valve check valve. If the check valve does not operate freely, replace the check valve assembly.

FIG. 14 (Continued)—Steering Trouble Symptoms and Possible Causes

TILT—AWAY STEERING COLUMN CONDITIONS

A. STEERING WHEEL WILL NOT TILT-AWAY WHEN IGNITION SWITCH IS TURNED OFF AND LEFT FRONT DOOR IS OPENED

Most Probable Cause	Action Indicated	If Defective
1. Blown fuse (no courtesy lights)	Check fuse between steering column relay and ignition switch.	Replace fuse
	IF OK	
2. Disconnected, pinched or obstructed vacuum line.	Disconnect hose that connects vacuum release valve to reservoir. Start engine and check for vacuum at the release valve end of hose. If there is no vacuum, disconnect hose from preceding connection and check vacuum. Repeat this test at each connection (forward or backward) until obstruction is located.	Remove any obstruction. Repair or replace worn or damaged tubing.
	IF OK	
3. Open circuit in steering column electrical circuit.	Check circuit continuity between left front door jamb switch and vacuum release valve solenoid with an ohmmeter test lamp. See Fig. 16.	Replace door jamb switch or make necessary repairs to the circuit.
	IF OK	
4. Defective vacuum release valve.	Disconnect wiring harness from vacuum release valve solenoid Fig. 16. Connect a positive lead (+) to the bayonet terminal. If vacuum release valve solenoid clicks or movement is detected by feeling the magnetic cylinder, the valve is satisfactory.	Replace vacuum release valve as required.
	IF OK	
5. Defective vacuum motor.	Disconnect rubber hose from vacuum motor. Connect a vacuum hose with minimum of 10 inches vacuum to motor and observe operation (See NOTE 1). Attach a pull scale to vacuum motor and apply minimum of 10 inches vacuum. If motor registers 16-18 pounds pull, it is satisfactory. The scale reading will be proportionally, higher than the amount of vacuum applied. Then check locking pawl for proper adjustment, also check pawl rod for binding or other damage.	Replace vacuum motor if defective. Remove steering column. Adjust the locking pawl correctly. Repair or replace damaged pawl rod.

NOTE 1. Vacuum can be obtained by attaching a hose directly to the engine manifold and running the engine or by using the vacuum source on a distributor stroboscope. If the motor has a tendency to operate but cannot pull the pawl free of the flange, disconnect the motor from the locking pawl rod when checking with pull scale.

FIG. 15—Tilt-Away Steering Column Trouble Diagnosis Guide

B. ENGINE WILL NOT START WITH LEFT DOOR CLOSED AND STEERING COLUMN IN DRIVE POSITION

Most Probable Cause	Action Indicated	If Defective
1. Wire disconnected from starter safety switch.	Check wiring connections.	Connect wires to switch.
	IF OK	
2. Starter safety switch not adjusted correctly.	Check clearance between switch and tab on locking pawl rod.	Adjust switch.
	IF OK	
3. Defective starter safety switch.	Disconnect the wires and connect an ohmmeter to the switch. The ohmmeter should read zero with the steering wheel in Drive position or it is defective. Place the steering wheel in the tilt-away position. If engine will not start and there is no vacuum reserve, pull downward on the locking pawl rod manually to release the wheel. The ohmmeter should register on the high (infinitive) side of scale or it is defective.	Replace starter safety switch, if found to be defective.

C. STEERING WHEEL WILL NOT HOLD IN NINE DIFFERENT POSITIONS OR WILL HOLD ONLY IN FOUR DIFFERENT POSITIONS

Most Probable Cause	Action Indicated	If Defective
1. Locking index damaged.	Remove upper flange. Check locking index for damaged grooves. Also check for broken or seized locking lever or a broken lever return spring.	Repair or replace all worn or damaged parts.

FIG. 15 (Continued)—Tilt—Away Steering Column Trouble Diagnosis Guide

D. EXCESSIVE STEERING WHEEL LOOSENESS

Most Probable Cause	Action Indicated	If Defective
1. Steering wheel attaching nut loose.	Remove steering wheel hub and check attaching nut for looseness.	Tighten attaching nut to specification. Apply loctite sealer C3AZ-19554-A to lock nut in place.
	IF OK	
2. Lower flange screws loose or retainers not properly seated.	Slip lower cover downward on steering tube and check retainer attaching screws. (Allen head) for looseness. Also check retainers for proper seating.	Seat the retainers properly and tighten the attaching screws.
	IF OK	
3. Defective ball bearings or pivot pins.	Remove upper flange and ball bearings. Check pivot pins for looseness in the locking index.	Replace all worn or damaged parts.
	IF OK	
4. Loss of preload in vacuum motor.	Disconnect vacuum motor from locking pawl rod. Vacuum motor push rod should extend 1/4 inch beyond locking pawl actuating rod if properly preloaded.	Replace vacuum motor.
	IF OK	
5. Locking pawl does not fully engage (adjusted too short).	Remove steering column. Check pawl adjustments.	Adjust locking pawl properly.

E. STEERING WHEEL LOOSE AT SOME POSITIONS AND NOT AT OTHERS

Most Probable Cause	Action Indicated	If Defective
1. Worn or oversize locking index slots.	Remove locking index and check slots for a worn or oversize condition.	Replace locking index.

F. STEERING WHEEL TILTS— AWAY WHEN ENGINE IS STARTED

Most Probable Cause	Action Indicated	If Defective
1. Vacuum reservoir hose connected directly to vacuum motor.	Disconnect vacuum hose from vacuum motor and place steering wheel in drive position. Start engine and observe action.	Connect vacuum hose to proper connections.

FIG. 15(Continued)—Tilt—Away Steering Column Trouble Diagnosis Guide

G. STEERING WHEEL WILL NOT STAY IN DRIVE POSITION

Most Probable Cause	Action Indicated	If Defective
1. Defective door jamb switch.	Remove the switch and connect an ohmmeter to the switch terminals. The gauge should read on the infinitive side of the scale when the plunger is depressed.	Replace switch if defective.

FIG. 15 (Continued)—Tilt-Away Steering Column Trouble Diagnosis Guide

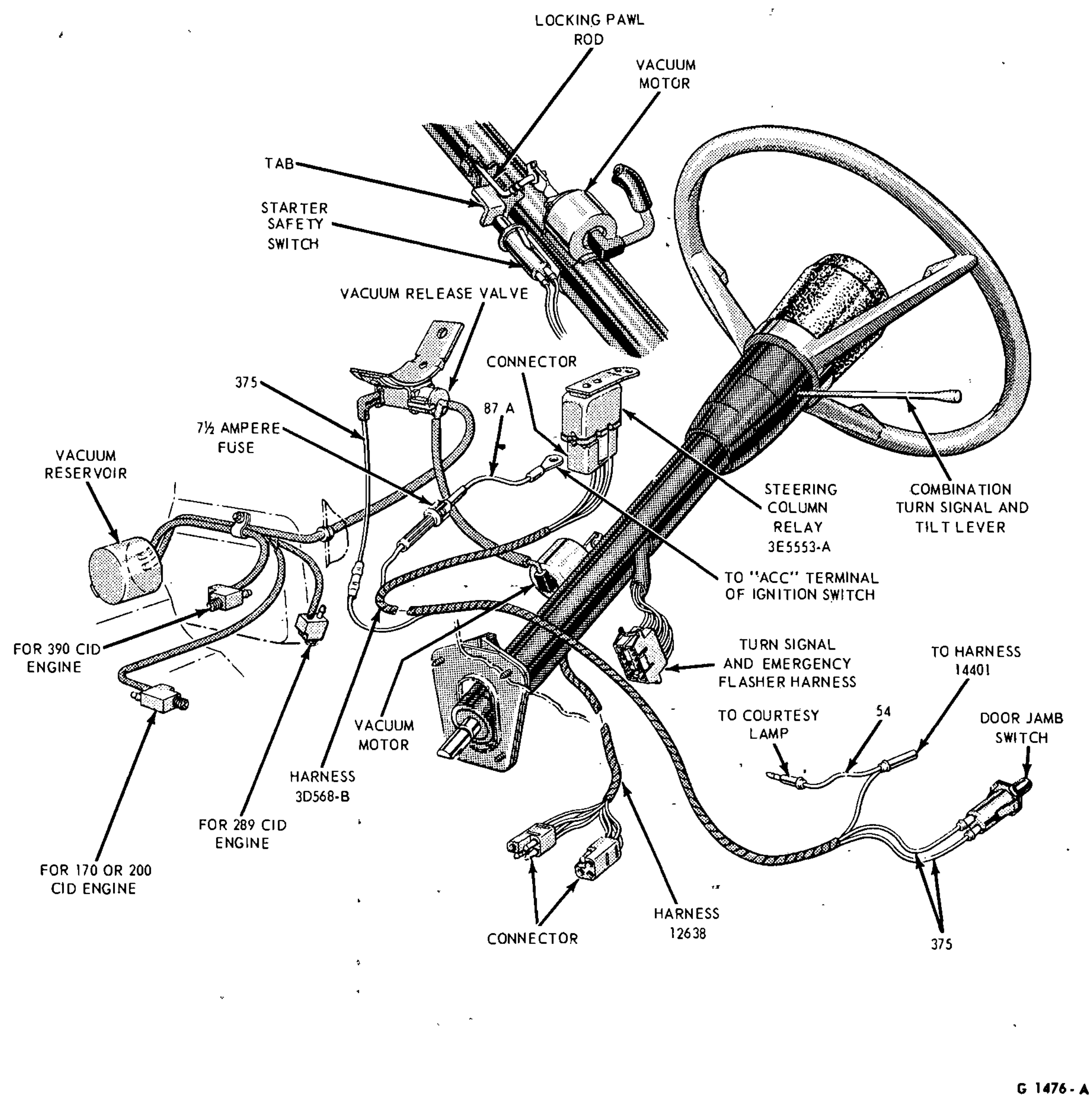


FIG. 16—Tilt Column Vacuum and Electrical Systems

PART 3-2— *Suspension*

1 DESCRIPTION AND OPERATION

FRONT SUSPENSION

Each front wheel rotates on a spindle. The upper and lower ends of the spindle are attached to upper and lower ball joints which are mounted to an upper and lower arm respectively. The upper arm pivots on a bushing and shaft assembly which is bolted to the underbody. The lower arm pivots on a bolt that is located in an underbody bracket (Figs. 1 and 11).

A coil spring seats between the upper arm and the top of the spring housing. A double acting shock absorber is bolted to the arm and the top of the spring housing.

The swiveling action of the ball joints allow the wheel and spindle assemblies to move up and down with changes in road surface. The swiveling ball joints also permit the spindles and wheels to be turned to the left or right by the steering gear and linkage.

The pivoting action of the suspension arms provides an **up and down** movement for the spindles and wheels as required by bumps or depressions in the road surface. The coil springs, shock absorbers and stabilizer bar control the front suspension up and down movements. The struts, which are connected between the suspension lower arms and the underbody provide forward and rearward stability to the front suspension.

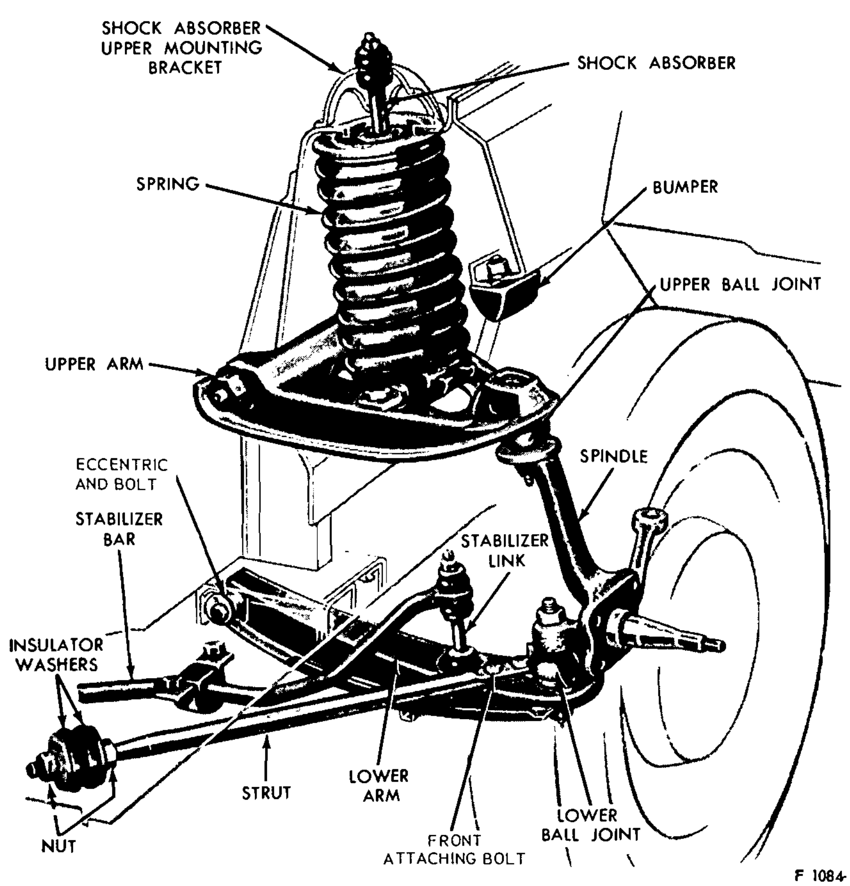


FIG. 1—Front Suspension—Typical

REAR SUSPENSION

Each rear wheel, hub, and brake drum assembly is bolted to the rear axle shaft flange. The wheel and axle shaft assembly rotates in the rear axle housing. Two spring pads integral with the axle housing, rest on two leaf type springs. The axle housing is fastened to the springs by spring clips. (U-bolts), spring clip plates and nuts (Figs. 2 and 15). Each spring is suspended from the underbody side rail by a hanger at the front and a shackle at the rear. The upper end of each shock absorber is mounted to a bracket in the underbody. The lower end is mounted to the spring clip plate.

The springs and shock absorbers provide for up and down movement of the rear axle and wheels as required by changes in the road surface. They also cushion road shocks.

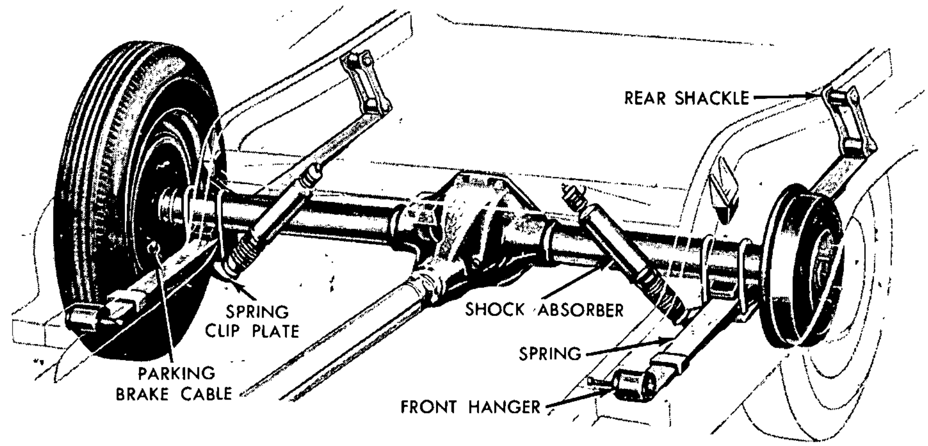


FIG. 2—Rear Suspension—Typical

2 IN-VEHICLE ADJUSTMENTS AND REPAIRS

HOISTING INSTRUCTIONS

Damage to suspension and/or steering linkage components may occur if care is not exercised when positioning the hoist adapters of 2 post hoists prior to lifting the vehicle.

If a 2 post hoist is used to lift the vehicle, place the adapters under the front suspension lower arms. **Do not allow the adapters to contact the steering linkage.**

UPPER BALL JOINT REPLACEMENT

1. Position a support between the upper arm and frame side rail as shown in Figs. 3 and 4; then, raise the vehicle and position safety stands.

2. Remove the wheel and tire.

3. Remove the cotter pin and nut from the upper ball joint stud.

4. Position the ball joint remover tool as shown in Fig. 5. **The tool should seat firmly against the ends of both studs, and not against the lower stud nut.** It may be necessary to remove the lower ball joint cotter pin if it prevents the tool from seating on the lower stud.

5. Turn the tool with a wrench until both studs are under tension, and then, with a hammer, tap the spindle near the upper stud to loosen the stud from the spindle. **Do not loosen the stud with tool pressure alone.** Raise the stud out of the spindle bore.

6. Using a large chisel, cut off the three upper ball joint retaining rivets and remove the ball joint.

7. Clean the end of the arm, and remove all burrs from the hole edges. Check for cracks in the metal at the holes, and replace the arm if it is cracked.

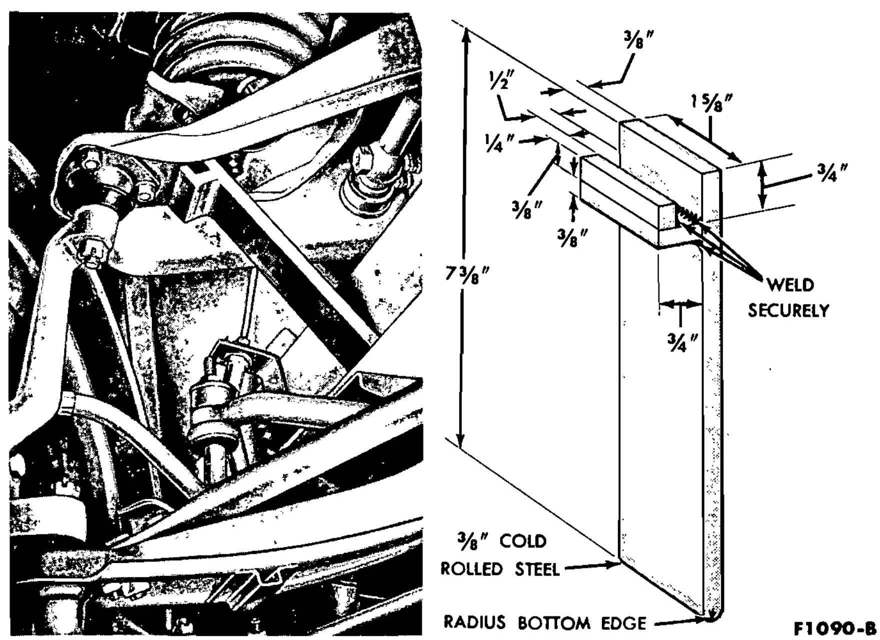


FIG. 3—Upper Arm Support—Mustang

8. Attach the new ball joint to the upper arm. Use **only the specified bolts, nuts, and washers. Do not rivet the new ball joint to the arm.** Torque the nuts to specification (Part 3-6).

9. Position the ball joint stud in the spindle bore, and torque the retaining nut to specification. Install a new cotter pin, tighten the nut if necessary to line up the cotter pin hole.

10. Lubricate the ball joint, and install the wheel and tire. Torque the lug nuts to specification (Part 3-6).

11. Remove the safety stands, and lower the vehicle.

12. Remove the support from between the upper arm and frame.

13. Check and, if necessary, adjust caster, camber, and toe-in.

UPPER ARM SHAFT AND/OR BUSHING REPLACEMENT ALL VEHICLES

1. Remove the shock absorber and upper mounting bracket as an assembly.

2. Raise the vehicle on a hoist, install safety stands, and remove the wheel cover or hub cap.

3. Remove the grease cap from the hub; then, remove the cotter pin, nut lock, adjusting nut and outer bearing from the hub.

4. Pull the wheel, tire, and the hub and drum off the spindle as an assembly.

5. Install the spring compressor tool Fig. 8.

6. Remove 2 upper arm to spring tower attaching nuts and swing the upper arm outboard from the spring tower.

7. Rotate the inner shaft so that the retaining studs can be removed. Remove the retaining studs with a soft mallet.

8. Unscrew the bushings from the shaft and suspension arm; then, remove the shaft from the arm.

9. Position the shaft in the arm, apply grease to the new bushings and O-rings, and install the bushings loose on the shaft and arm. **Turn the bushings so that the shaft is exactly centered in the arm.** The shaft will be properly centered when dimensions A and B in Fig. 6 are equal.

10. Fabricate a spacer from a section of 3/4-inch diameter pipe or metal of comparable size and strength. The spacer should be 6 15/16 inches long.

11. Position the spacer parallel with the inner shaft, and force the spacer between the flanges of the upper arm (Fig. 7).

If the spacer can not be forced between the arm flanges due to excessive distortion, replace the upper arm assembly.

12. With the spacer positioned in the arm, torque the bushings to specification. Move the arm on the shaft to be sure that no binding exists, then remove the spacer.

13. Attach the suspension upper arm to the underbody. Release the front spring.

14. Remove the spring compressor and position the wheel, tire, and hub and drum on the spindle.

15. Install the bearing, washer, adjusting nut and nut lock. Adjust the wheel bearing as outlined in Part 3-5 and install the cotter pin, grease cap and hub cap or wheel cover.

16. Lower the vehicle and install the shock absorber and upper mounting bracket.

17. Check caster, camber, and toe-in and adjust as necessary (Part 3-1).

STABILIZER REPLACEMENT

1. Raise the vehicle high enough to provide working space, and place supports under both front wheels.

2. Disconnect the stabilizer from each link. Disconnect both stabilizer

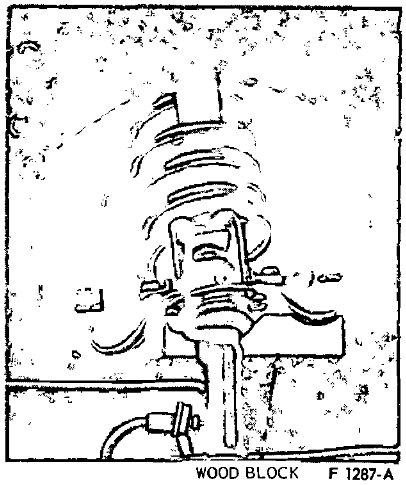


FIG. 4—Upper Arm Support—Comet, Falcon, and Fairlane

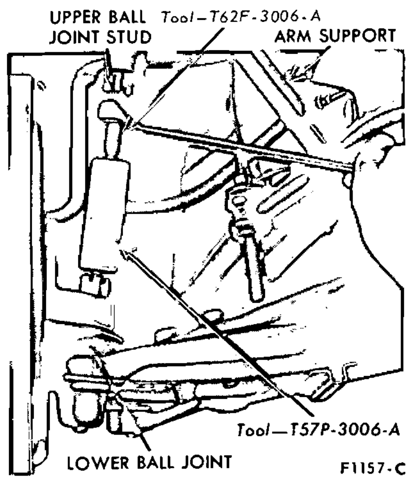


FIG. 5—Loosening Ball Joint Studs in Spindle—Typical

retaining brackets, and remove the stabilizer.

3. Coat the necessary parts of the stabilizer with RUGLYDE or a comparable lubricant, and slide new insulators onto the stabilizer.

4. Connect the stabilizer retaining brackets, and connect the stabilizer to both links. Torque the bracket retaining screws and the link bolt nut to specification.

5. Remove the supports and lower the vehicle.

LOWER ARM STRUT AND/OR BUSHING REPLACEMENT

ALL EXCEPT COUGAR

1. Position the block as shown in Fig. 3 under the upper arm for support.

2. Raise the vehicle, position saf-

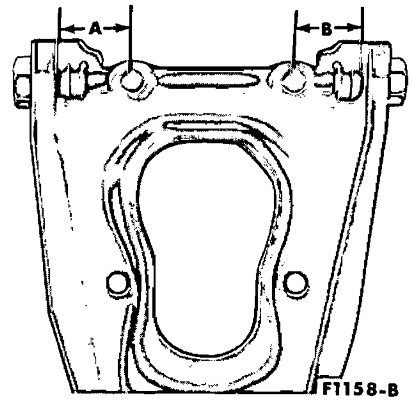


FIG. 6—Shaft Centered in Arm—Typical

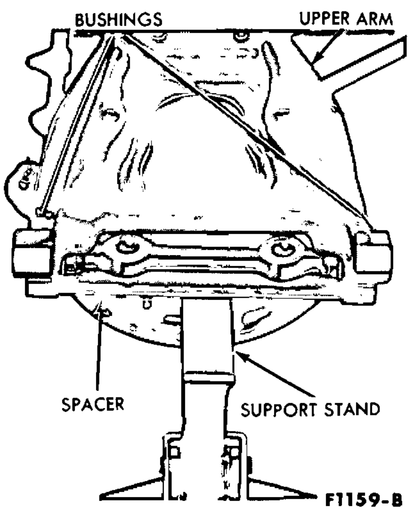


FIG. 7—Torque Upper Arm Inner Shaft Bushings—Typical

ety stands, and remove the wheel and tire.

3. Remove the strut-to-bracket forward attaching nut, washer and insulator bushings. See Fig. 11.

4. Remove the two strut-to-lower arm attaching nuts and bolts; then, lift the strut with rear insulator bushing washer from the vehicle.

5. Install the new rear washer and insulator bushing on the forward end of the strut rod.

6. Position the strut into the mounting bracket and to the lower suspension arm. Install the strut-to-arm attaching bolts and nuts, and torque to specification.

7. Install the forward insulator bushing, washer, and nut on the forward end of the strut.

8. Install the wheel and tire, remove the safety stands and lower the vehicle. Remove the tool supporting the upper arm.

9. Adjust the caster and chamber to specification.

COUGAR

Removal

1. Raise the vehicle and support the lower arm. Remove the wheel and tire.
2. Remove the nut, washer and bushing from the front of the lower arm strut. See Fig. 11.
3. Remove the two bolts that attach the strut bracket to the lower arm.
4. Remove the bracket to strut attaching bolt and separate the bracket from the strut.

Installation

1. Assemble the bracket to the strut but do not tighten the bolt.
2. Thread a nut onto the strut so that approximately 3 15/16 inches of threads are exposed. Place a washer, bushing and sleeve on the strut.
3. Insert the threaded end of the strut into the bracket.
4. Secure the strut bracket to the lower arm with the two attaching bolts. Torque the bolts to specification.
5. Install the bushing washer and nut on the front of the strut.
6. Install the wheel and tire.
7. Lower the vehicle.
8. Adjust the caster and camber to specification.

COMET, FALCON, AND FAIRLANE

Removal

1. Raise the vehicle and install safety stands.
2. Remove the lower arm strut front attaching nuts, washer and bushing at the frame bracket.
3. Remove two bolts and nuts attaching the strut to the lower arm and remove the strut.
4. Remove the bushing, washer and nut from the strut.

Installation

1. Install the nut, washer and bushing on the strut.
2. Position the strut to the front bushing bracket and to the lower arm. Install the strut to lower arm attaching bolts and nuts and torque to specification.
3. Position the strut front bushing and washer on the strut and install the adjusting nut.
4. Tighten the strut adjusting nuts against the strut frame bracket.
5. Lower the vehicle and check caster, camber and toe-in and adjust as necessary.

3 REMOVAL AND INSTALLATION

HOISTING INSTRUCTIONS

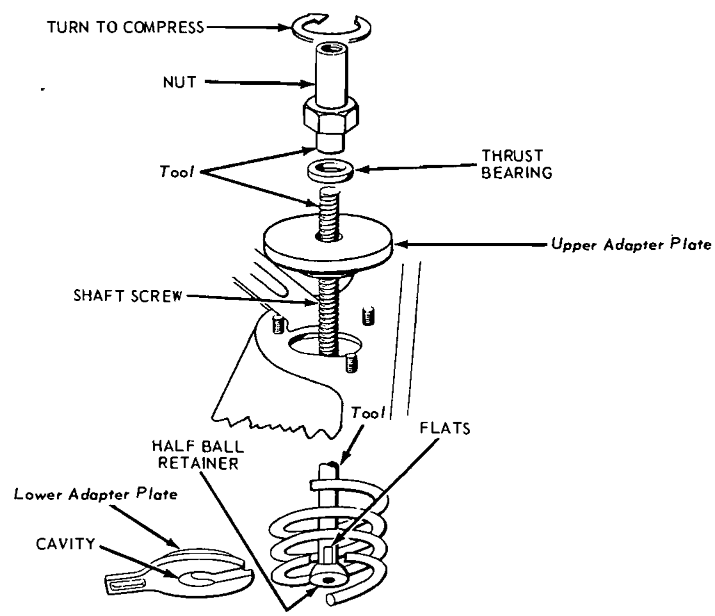
Damage to suspension and / or steering linkage components may occur if care is not exercised when positioning the hoist adapters of 2 post hoists prior to lifting the vehicle.

If a 2 post hoist is used to lift the vehicle, place the adapters under the front suspension lower arms. **Do not allow the adapters to contact the steering linkage.**

FRONT SPRING

REMOVAL

1. Remove the shock absorber and upper mounting bracket as an assembly.
2. Raise the vehicle on a hoist, install safety stands, and remove the wheel cover or hub cap.
3. Remove the grease cap from the hub; then, remove the cotter pin, nut lock, adjusting nut and outer bearing from the hub.
4. Pull the wheel, tire and the hub and drum off the spindle as an assembly.
5. Install the spring compressor tool (see Fig. 8), as shown in Fig. 9.
6. Remove 2 upper arm to spring tower attaching nuts and swing the upper arm outboard from the spring tower (Fig. 10).
7. Release the spring compressor tool and remove the tool from the spring. Then, remove the spring from the vehicle.



FRONT SPRING REMOVING - REPLACING TOOLS		
VEHICLE	BASIC TOOL NO.	ADAPTER
COMET	Tool-4201-C	T67P-5310-B
COUGAR	Tool-4201-C	T67P-5310-B
FALCON	T63P-5310-A	T67P-5310-A
FAIRLANE	T63P-5310-A	T67P-5310-A
MUSTANG	T63P-5310-A	T67P-5310-A

F 1242-C

FIG. 8—Spring Tool Installation

INSTALLATION

1. Place the spring upper insulator on the spring and secure in place with tape.
2. Position the spring in the spring tower. Install the spring compressor, (Fig. 8) and compress the spring.
3. Swing the upper arm inboard and insert the bolts through the holes in the side of the spring tower. Then, install the attaching nuts and torque them to specification.
4. Release the spring pressure and

guide the spring into the upper arm spring seat. **The end of the spring must seat against the tab on the spring seat.**

5. Remove the spring compressor and position the wheel, tire, and hub and drum on the spindle.

6. Install the bearing, washer, adjusting nut and nut lock. Adjust the wheel bearing as outlined in Part 3-5 and install the cotter pin, grease cap, and hub cap or wheel cover.

7. Lower the vehicle and install the shock absorber and upper mounting bracket.

8. Check caster, camber, and toe-in and adjust as necessary (Part 3-1).

FRONT SUSPENSION UPPER ARM

MUSTANG AND COUGAR

Removal

1. Raise the front of the vehicle, position safety stands under the frame, and lower the vehicle slightly.

2. Remove the wheel and tire assembly.

3. Remove the shock absorber lower attaching nuts and washers.

4. Remove the shock absorber upper mounting bracket attaching nuts, and remove the shock absorber and bracket as an assembly (Fig. 12).

On all 8-cylinder vehicles, remove the air cleaner to obtain access for tool installation.

5. Install the spring compressor Tool and compress the spring (Figs. 8 and 9).

6. Position a safety stand under the lower arm.

7. Remove the cotter pin from the nut on the upper ball joint stud, and loosen the nut one or two turns. **Do not remove the nut from the stud at this time.**

8. Position the ball joint remover tool between the upper and lower ball joint studs as shown in Fig. 5. **The tool should seat firmly against the ends of both studs and not against the stud nuts.**

9. Turn the tool with a wrench until the tool places the studs under tension; then, tap the spindle near the upper stud with a hammer to loosen the stud in the spindle. **Do not loosen the stud in the spindle with tool pressure only.** If both arms are being removed, loosen the lower stud in the same manner as the upper stud.

10. Remove the nut from the upper stud and lift the stud out of the spindle.

11. Remove the upper arm inner shaft attaching nuts from the engine compartment, and remove the upper

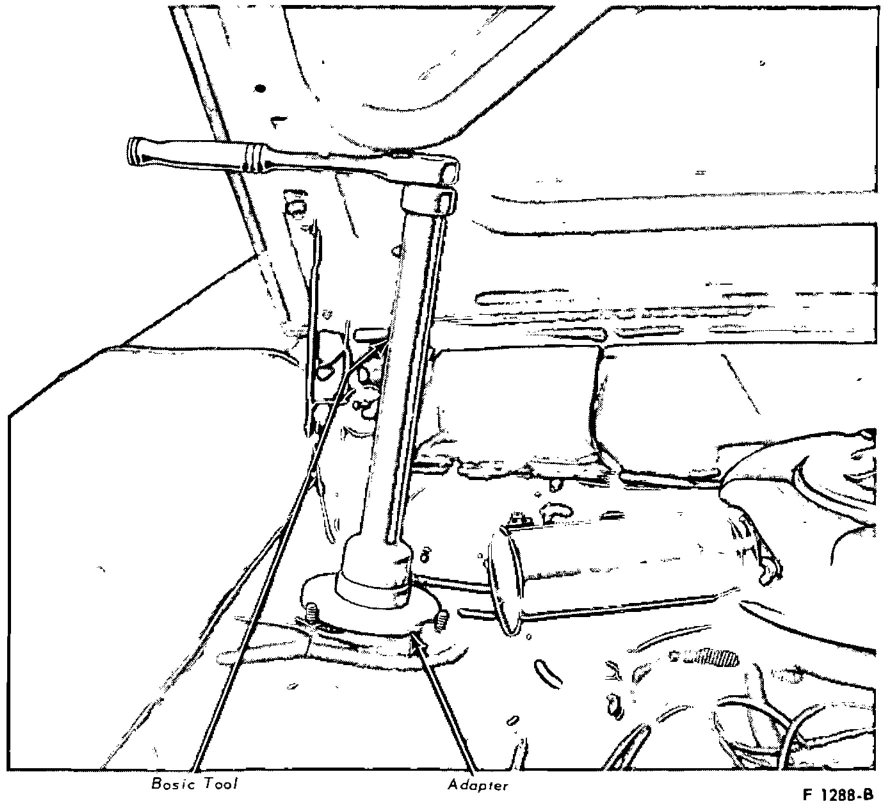


FIG. 9—Spring Compressor Tool Installed—Upper View—Typical

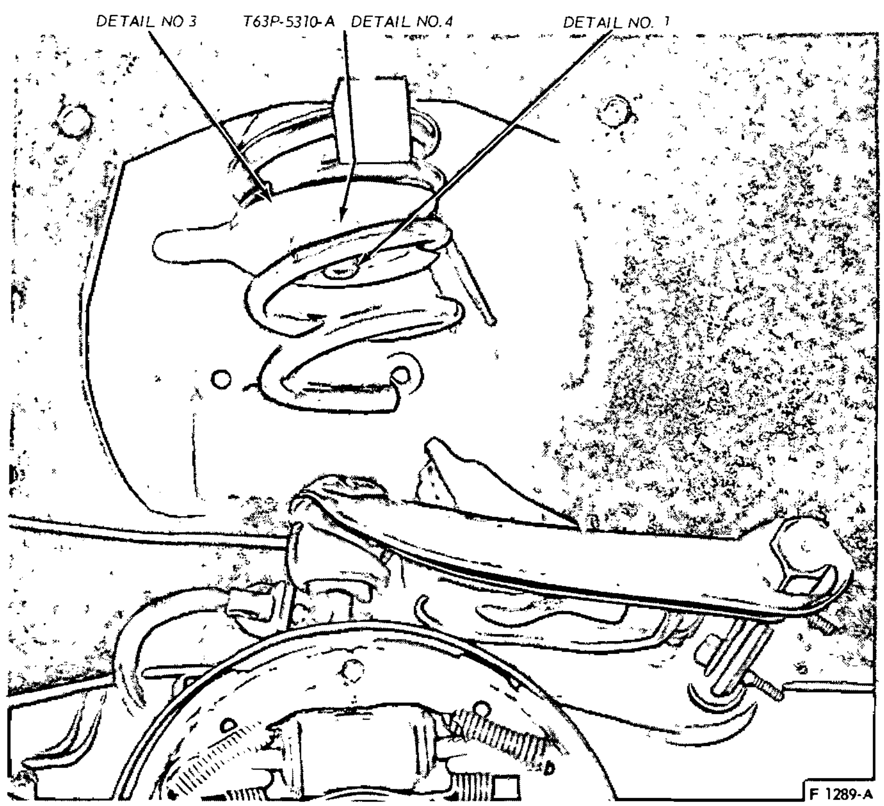


FIG. 10—Compressing Spring—Lower View —Comet, Falcon, and Fairlane

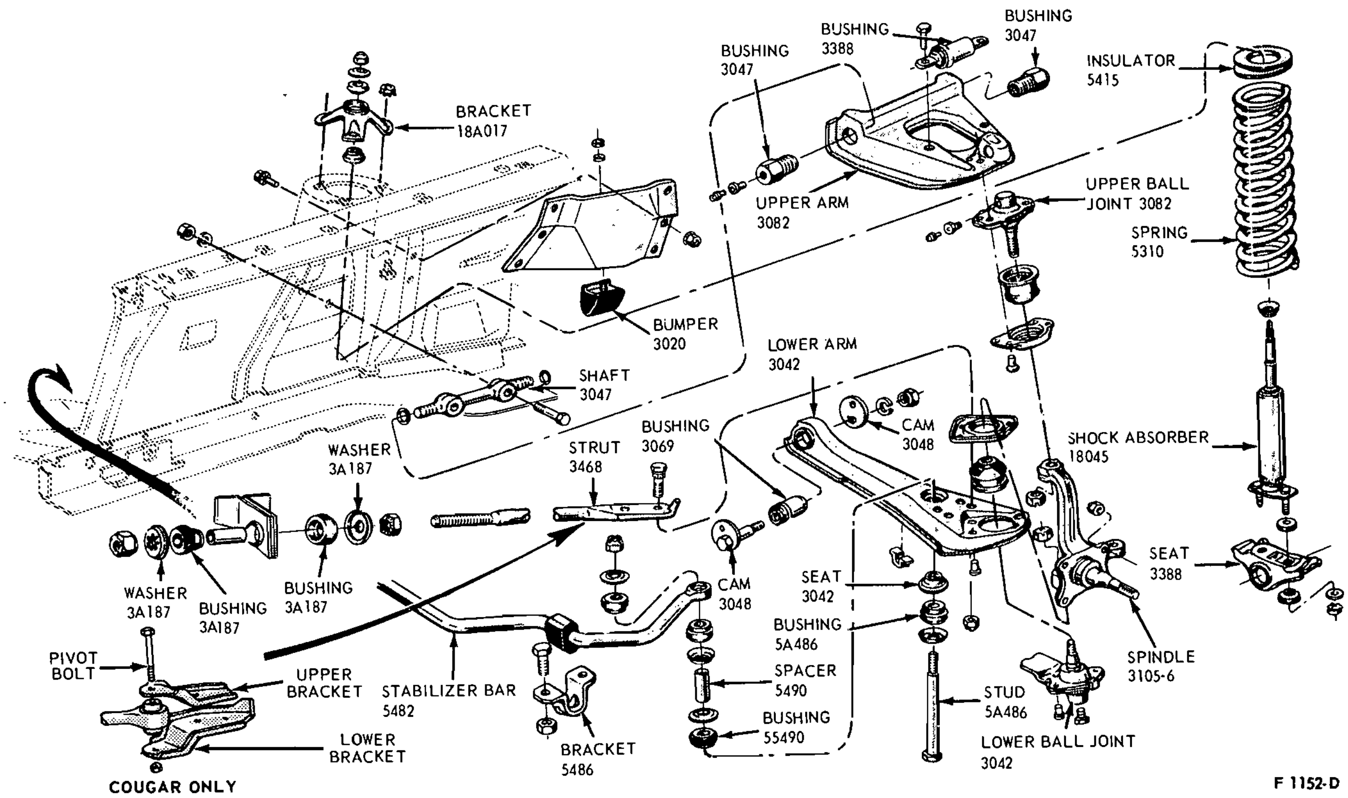


FIG. 11—Front Suspension Assembly

arm. Measure and note the total shim thickness at each inner shaft bolt.

12. Wipe off all loose dirt from the upper arm parts. **Do not wash the ball joint with a solvent.**

Installation

1. Position the upper arm on the underbody mounting bracket, and install the nuts and lock washers on the two inner shaft attaching bolts. **The specified keystone-type lockwashers must be used.** Torque the nuts to specification.

2. Position the upper ball joint stud in the top of the wheel spindle, and install the stud nut. Torque the nut to specification, and continue to tighten it until the cotter pin hole and slots line up. Install a new cotter pin.

3. Release the coil spring, remove the tool, and install the front shock absorber and the wheel and tire.

COMET, FALCON, AND—FAIRLANE

Removal

1. Remove the front shock absorber from the vehicle.

2. Raise the vehicle and install safety stands under the frame side rails.

3. Remove the hub cap or wheel cover and the wheel and tire.

4. Install the spring compressor Tool, see Fig. 8, and compress the spring (Fig. 10).

5. Remove the cotter pin from the upper ball joint stud and loosen the stud nut.

6. Position the ball joint remover tool as shown in Fig. 5. **The tool should seat firmly against the ends of both studs and not against the lower stud nut.** It may be necessary to remove the lower ball joint cotter pin if it prevents the tool from seating on the stud.

7. Turn the tool with a wrench until both studs are under tension; then, tap the spindle near the upper stud with a hammer to loosen the stud from the spindle. **Do not loosen the stud with tool pressure alone.**

8. Remove the ball joint remover tool and remove the ball joint stud nut from the stud.

9. Remove 2 nuts and washers that attaches the upper arm to the spring tower. Pull the upper arm away from the spring tower, lift the ball joint stud from the spindle, and remove the upper arm from the vehicle.

10. Remove 2 nuts and bolts and remove the spring pivot from the upper arm.

Installation

1. Position the spring pivot to the upper arm and install the 2 attaching bolts and nuts. Torque the nuts to specification.

2. Position the upper arm to the spring tower and the ball joint stud to the spindle. Install but do not tighten the ball joint stud nut.
3. Position the upper arm to spring tower and install the washers and attaching nuts. Torque the nuts to specification.
4. Release the spring compressor tool while aligning the spring with the upper arm spring pivot. Then, remove the tool.
5. Torque the ball joint stud nut to specification (Part 3-6). Continue to tighten the nut until the slots in the nut are in line with the hole in the ball joint stud. Then, install a new cotter pin.
6. Install the wheel and tire and the hub cap or wheel cover.
7. Remove the safety stands and lower the vehicle.
8. Install the shock absorber.

FRONT SUSPENSION LOWER ARM

MUSTANG AND COUGAR

Removal

1. Position a support between the upper arm and side rail as shown in Fig. 3.
2. Raise the vehicle, position safety stands, and remove the wheel and tire.
3. Remove the stabilizer bar and link attaching nut. Disconnect the bar from the link, and remove the link bolt.
4. Remove the strut to lower arm attaching nuts and bolts (Mustang only). On a Cougar, remove the two bolts that attach the articulated strut bracket to the lower arm (Fig. 11).
5. Remove the cotter pin from the nut on the lower ball joint stud, and loosen the nut one or two turns. **Do not remove the nut from the stud at this time.**
6. Straighten the cotter pin on the upper ball joint stud nut. Position the ball joint remover tool between the upper and lower ball joint studs in the reverse position from that shown in Fig. 5. **The tool should seat firmly against the ends of both studs and not against the stud nuts.**
7. Turn the tool with a wrench until the tool places the studs under tension, and tap the spindle near the lower stud with a hammer to loosen the stud in the spindle. **Do not loosen the stud in the spindle with tool pressure only.** If both arms are being removed, loosen the upper stud in the same manner as the lower stud.
8. Remove the nut from the lower ball joint stud, and lower the arm.

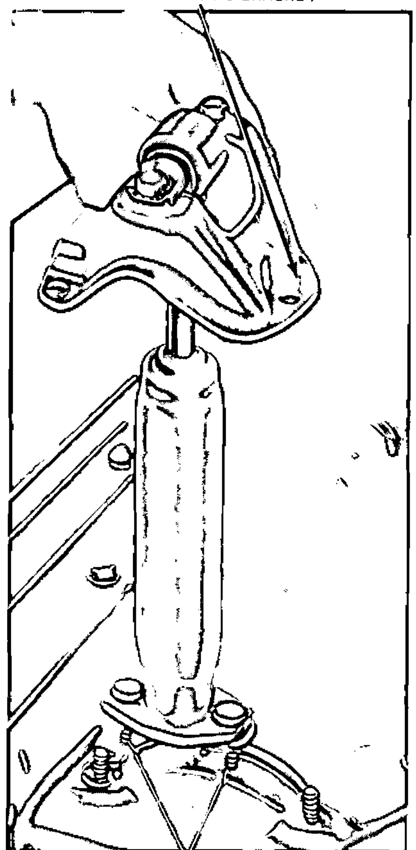


FIG. 12—Removing or Installing Front Shock Absorber—Typical

9. Remove the lower arm to underbody pivot bolt, nut and washer. Remove the lower arm.

Installation

1. Position the lower arm to the underbody bracket and install the pivot bolt, washer, and nut loose.
2. Raise the lower arm, guide the lower ball joint stud into the spindle bore, and install the stud attaching nut loose.
3. Install the stabilizer link bolt, washers, bushings and spacer. Connect the stabilizer bar to the link. Install the attaching nut and torque to specifications (Fig. 11).
4. Position the strut to the lower arm. Install the attaching bolts and nuts, and torque to specification (Mustang only). On a Cougar, position the articulated strut bracket to the lower arm and install the attaching bolts (Fig. 11). Torque the bolts to specification.
5. Torque the lower ball joint stud nut to specification, continue to tighten the nut until the cotter pin hole and slots are aligned, and install a new cotter pin.

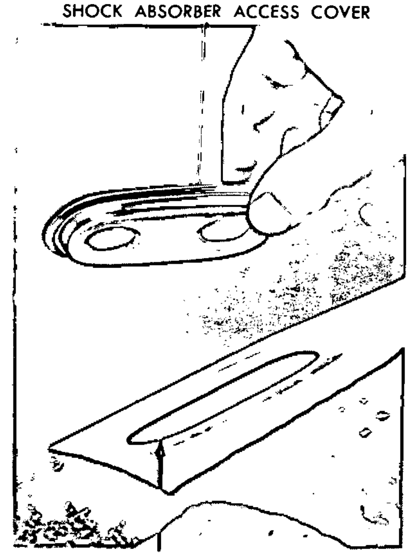


FIG. 13—Rear Shock Absorber Access Cover

6. Torque the lower arm-to-underbody pivot bolt and nut to specification.
7. Remove the safety stands and lower the vehicle.
8. Remove the support from between the upper arm and frame.
9. **Check and, if necessary, adjust caster, camber, and toe-in.**

COMET, FALCON, AND FAIRLANE

Removal

1. Raise the vehicle and position safety stands under the side rails.
2. Remove the hub cap or wheel cover.
3. Remove the wheel, tire and hub and drum as an assembly.
4. Remove the stabilizer bar link attaching nut and remove the washers, bushings, spacer, and link bolt (Fig. 11).
5. Remove the 2 strut to lower arm attaching nuts and bolts.
6. Remove the lower ball joint stud nut cotter pin and loosen the nut one or two turns. **Do not remove the nut from the stud at this time.**
7. Position the ball joint remover tool between the upper and lower ball joint studs in the reverse position (upside down) from that shown in Fig. 11. **The tool should seat firmly against the ends of both studs and not against the stud nuts.**
8. Turn the tool with a wrench until the studs are under tension. Tap the spindle near the lower stud with a hammer to loosen the stud in the

spindle. **Do not loosen the stud with tool pressure only.**

9. Remove the tool and remove the nut from the lower ball joint stud.

10. Mark the location of the eccentric and eccentric bolt at the lower arm to underbody attachment.

11. Remove the nut, bolt, and eccentrics attaching the lower arm to the underbody and remove the lower arm.

Installation

1. Position the lower arm to the underbody and install the bolt, eccentrics, and nut.

2. Position the ball joint stud in the spindle bore and install the attaching nut.

3. Adjust the eccentrics to the previous marked location and torque the nut to specification (Part 3-6).

4. Position the strut to the lower arm and install the attaching bolts

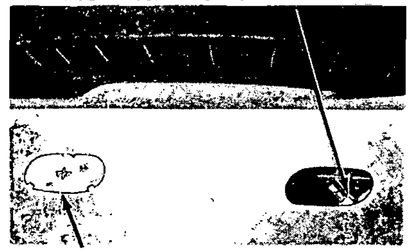


FIG. 14—Rear Shock Absorber Upper Mounting

and nuts. Torque the nuts to specification (Part 3-6).

5. Position the stabilizer bar link to the lower arm and install the bolt, washers, bushings, spacer, and attaching nut. Torque the nut to specification (Part 3-6).

6. Torque the lower ball joint stud nut to specification (Part 3-6) and install the cotter pin.

7. Install the wheel, tire, and hub and drum on the spindle and adjust the wheel bearing (Part 3-5).

8. Install the hub cap or wheel cover, remove the safety stands, and lower the vehicle.

9. Check caster, camber, and toe-in and adjust as necessary.

FRONT WHEEL SPINDLE

DRUM BRAKES

Removal

1. Position a support between the upper arm and frame as shown in Figs. 3 and 4; then, raise the vehicle and position safety stands.

2. Remove the hub cap or wheel cover.

3. Remove the grease cap from the hub; then, remove the adjusting nut, washer, and outer bearing cone and roller assembly.

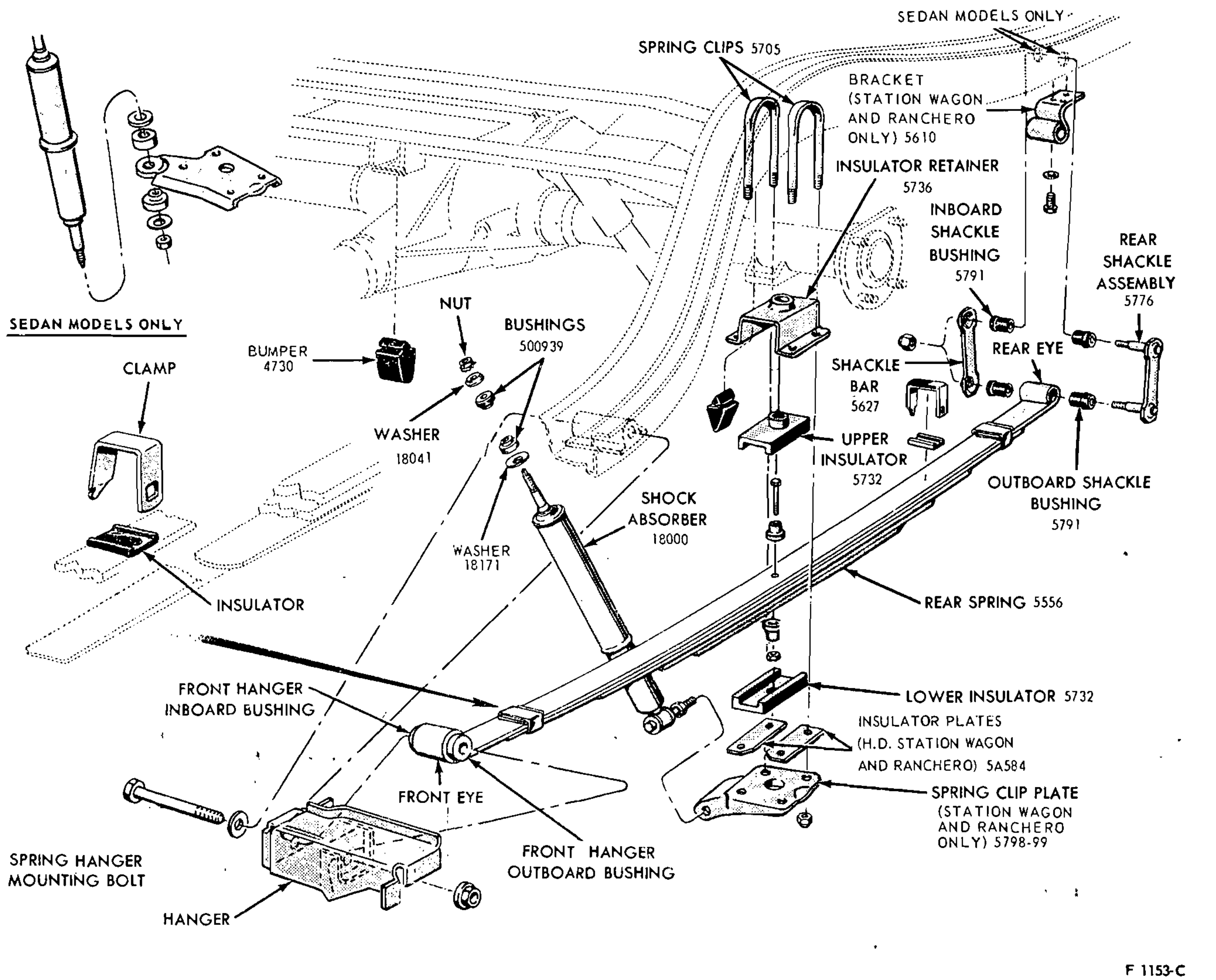


FIG. 15—Rear Spring and Shock Absorber— Typical

4. Pull the wheel, hub, and drum assembly off the wheel spindle.

5. Remove the brake carrier plate from the spindle. Support the plate to prevent damage to the brake hose.

6. Disconnect the spindle connecting rod end from the spindle arm using Tool 3290-C.

7. Remove the cotter pins from both ball joint stud nuts, and loosen the nuts one or two turns. **Do not remove the nuts from the studs at this time.**

8. Position the ball joint remover tool between the upper and lower ball joint studs (Fig. 5). **The tool should seat firmly against the ends of both studs and not against the stud nuts.**

9. Turn the tool with a wrench until the tool places the studs under tension, and, with a hammer, tap the spindle near the studs to loosen them in the spindle. **Do not loosen the studs in the spindle with tool pressure alone.**

10. Remove the stud nuts and remove the spindle from both studs.

Installation

1. Position the spindle on the lower ball joint stud and install the stud nut (Fig. 11).

2. Raise the lower suspension arm and guide the upper ball joint stud into the spindle. Install the stud nut.

3. Torque the upper stud nut and then the lower stud nut to specification. Continue to tighten both nuts until the cotter pin holes and slots line up. Install new cotter pins.

4. Connect the spindle connecting rod end to the spindle arm.

5. Install the brake carrier plate on the spindle, and torque the bolts to specification.

6. Install the wheel and drum and adjust the wheel bearing (Part 3-5).

7. Remove the safety stands, and lower the vehicle.

8. Remove the support from between the upper arm and frame.

9. **Check and, if necessary, adjust caster, camber, and toe-in.**

DISC BRAKES

Removal

1. Remove the hub cap or wheel cover, and remove the wheel and tire from the hub.

2. Remove two bolts attaching the caliper to the caliper bracket. Remove the caliper from the rotor and wire it to the underbody to prevent damage to the brake hose.

3. Remove the grease cap from the hub, then, remove the adjusting nut, washer, and outer bearing cone and roller assembly.

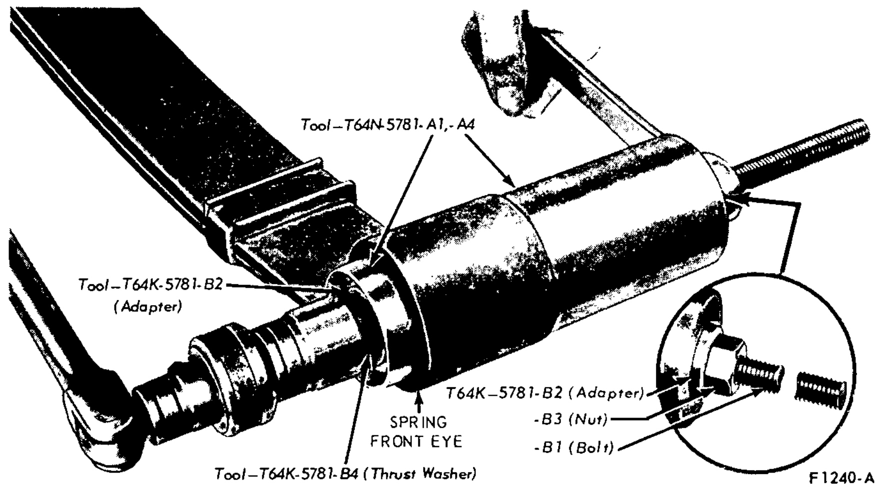


FIG. 16—Rear Spring Front Bushing Removal—Typical

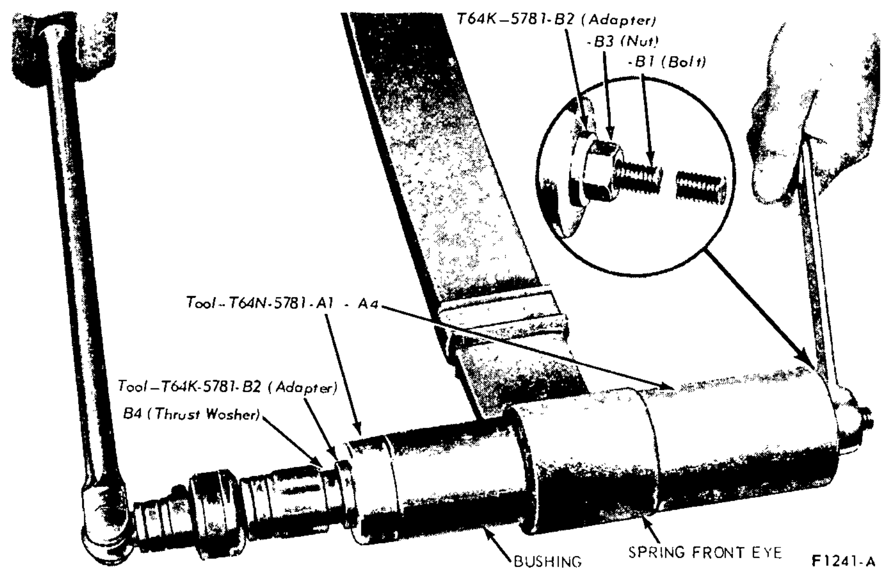


FIG. 17—Rear Spring Front Bushing Installation—Typical

4. Pull the hub and rotor assembly off the wheel spindle.

5. Remove four bolts and nuts and remove the splash shield and caliper bracket from the spindle.

6. Disconnect the spindle connecting rod end from the spindle arm using Tool-3290-C.

7. Remove the cotter pins from both ball joint stud nuts, and loosen the nuts one or two turns. **Do not remove the nuts from the studs at this time.**

8. Position the ball joint remover tool between the upper and lower ball joint studs (Fig. 5). **The tool should seat firmly against the ends of both studs and not against the stud nuts.**

9. Turn the tool with a wrench until the tool places the studs under tension, and, with a hammer, tap the spindle near the studs to loosen them in the spindle. **Do not loosen the studs in the spindle with tool pressure alone.**

10. Position a floor jack under the lower suspension arm.

11. Remove the upper and lower ball joint stud nuts; lower the jack and remove the spindle.

Installation

1. Position the spindle on the lower ball joint stud and install the stud nut (Fig. 11). Torque the nut to specification and install the cotter pin.

2. Raise the lower suspension arm, and guide the upper ball joint stud into the spindle. Install the stud nut.

3. Torque the nut to specifications and install the cotter pin. Then, remove the floor jack.
4. Connect the spindle connecting rod end to the spindle arm and install the attaching nut. Torque the nut to specification and install the cotter pin.
5. Position the caliper bracket and splash shield to the spindle and install the attaching bolts and nuts. Torque the nuts and bolts to specification.
6. Install the hub and rotor on the spindle.
7. Position the caliper to the rotor and caliper bracket and install the attaching bolts.
8. Install the wheel and tire on the hub and adjust the wheel bearing (Part 3-5).

9. Install the hub cap or wheel cover.

10. Before driving the vehicle, pump the brake pedal several times to obtain normal brake lining to rotor clearance and restore normal brake pedal travel.

FRONT SHOCK ABSORBER

REMOVAL

1. Raise the hood and remove 3 shock absorber upper mounting bracket to spring tower attaching nuts.

2. Raise the front of the vehicle and place safety stands under the lower arms.

3. Remove 2 shock absorber lower attaching nuts and washers.

4. Lift the shock absorber and upper bracket from the spring tower (Fig. 12) and remove the bracket from the shock absorber.

INSTALLATION

1. Install the upper mounting bracket on the shock absorber and torque to specification.

2. Position the shock absorber and upper mounting bracket in the spring tower, making sure the shock absorber lower studs are in the pivot plate holes.

3. Install the 2 washers and retaining nuts on the shock absorber lower studs and torque to specification.

4. Install the 3 shock absorber upper mounting bracket to spring tower retaining nuts and torque to specification. Then, remove the safety stands and lower the vehicle.

REAR SHOCK ABSORBER—

MUSTANG AND COUGAR

Removal

1. Disconnect the shock absorber from the spring clip plate (Fig. 15).

2. Remove the shock absorber access cover from the luggage compartment (Fig. 13).

3. Remove the shock absorber upper attaching nut.
4. Compress the shock absorber and remove it from the vehicle. Remove the bushings and washers from the shock absorber studs.

Installation

1. Place the bushing and inner washer on the shock absorber stud.
2. Connect the upper stud to the mounting, and install the bushing, outer washer, and nut on the stud. Torque the nut to specification, and install the cover.
3. Connect the lower stud to the spring clip plate, and install the bushing, outer washer, and nut on the stud. **Be sure the spring clip plate is free of burrs.** Tighten the nut to specification.

COMET, FALCON, AND FAIRLANE (EXCEPT CONVERTIBLE)

Removal

1. Open the luggage compartment door, and remove the spare wheel and tire.
On the Ranchero, remove the attaching screws, and lift the forward half of the floor panel from the body; then, remove the access cover from the opening in the floor pan over the shock absorber.
On station wagons, remove the access cover from the opening in the seat riser over the shock absorber.

2. Fold back the floor mat and remove the shock absorber access cover from the floor pan. Remove the nut, outer washer, and rubber bushing that retain the shock absorber to the upper mounting in the floor pan (Fig. 14).

3. Raise the vehicle and remove the retaining nut, outer washer and bushing from the shock absorber at the spring clip plate (Fig. 15). Compress the shock absorber and remove it from the vehicle.

4. If the shock absorber is serviceable and requires new bushings remove the inner bushings and washers from the shock absorber studs.

Installation

1. Place the inner washer and bushing on each shock absorber stud.
2. Expand the shock absorber and position it to the spring clip plate and to the mounting in the floor pan.
3. Connect the lower stud to the spring clip plate, and install the bushing, outer washer, and nut on the stud (Fig. 15). **Be sure the spring clip plate is free of burrs.** Tighten the nut to specification.

On the Ranchero, after tightening the nut to specification, install the forward half of the floor panel.

4. From the luggage compartment, install the bushing outer washer and attaching nut to the upper mounting stud (Fig. 14). Torque to specification. On a station wagon, replace the floor bed panel (14 screws).
5. Place the spare wheel and tire in the luggage compartment, and secure it in the storage position.

COMET AND FAIRLANE CONVERTIBLE

Removal

1. Remove the rear seat cushion and seat back.
2. Partially raise the vehicle on a hoist. With an assistant under the vehicle holding the shock absorber, remove the nut from the top of the shock absorber.
3. Remove the lower shock absorber attaching nut and remove the shock absorber.

Installation

1. Position the washers and bushings on the shock absorber and position the shock absorber to the lower attachment. Install the bushing, outer washer, and attaching nut and torque the nut to specification (Part 3-6).
2. Lower the vehicle and install the bushing, outer washer, and attaching nut on the top of the shock absorber. Torque the nut to specification.
3. Install the rear seat back and seat cushion.

REAR SPRING AND/OR BUSHING

REMOVAL

1. Raise the vehicle on a hoist and place supports beneath the underbody and under the axle.

2. Disconnect the lower end of the

shock absorber from the spring clip plate, and push the shock out of the way. Remove the supports from under the axle.

3. Remove the spring clip plate nuts from the U-bolts; then, remove the plate (Fig. 15). Raise the rear axle just enough to remove the weight from the spring.

4. Remove the two attaching nuts, the rear shackle bar, and the two shackle inner bushings.

5. Remove the rear shackle assembly and the two outer bushings.

6. Remove the front hanger bolt, nut, and washer from the eye at the forward end of the spring. Lift out the spring assembly.

7. If the front bushing is being replaced, assemble the special tool combination to the bushing in the spring front eye as shown in Fig. 16.

8. While holding the tool nut, tighten the tool bolt against the tool thrust washer, the adapter, and detail A1. This operation will force the bushing out of the spring eye into detail A4 of the tool as shown.

INSTALLATION

1. Assemble the bushing and the special tool combination to the spring front eye as shown Fig. 17.

2. While holding the tool nut, tighten the tool bolt against the tool thrust washer, adapter, and detail A4 to force the bushing into the spring eye as shown.

3. Position the spring under the rear axle and insert the shackle assembly into the rear hanger bracket and the rear eye of the spring.

4. Install the shackle inner bushings, the shackle plate, and the locknuts. Tighten the locknuts finger tight.

5. Position the spring front eye in the front hanger, slip the washer on the front hanger bolt, and (from the inboard side) insert the bolt through the hanger and eye. Install the locknut on the hanger bolt and tighten finger tight.

6. Lower the rear axle until it rests on the spring. Position the spring clip plate on the clips (U-bolts). Install the U-bolt nuts and torque to specification.

7. Connect the lower end of the shock absorber to the spring clip plate.

8. Place safety stands under the rear axle, lower the vehicle until the spring is in the approximate curb load position, and then torque the front hanger stud locknut to specification.

9. Torque the rear shackle locknuts to specification.

10. Remove the safety stands and lower the vehicle.

PART 3-3—*Manual Steering*

1 DESCRIPTION

STEERING GEAR

The steering gear (Fig. 1) is of the worm and recirculating ball type. The sector shaft rotates in needle bearings that are pressed into the gear housing.

The worm bearing preload is controlled by the large bearing adjuster which is threaded into the housing. The sector shaft mesh load is controlled by an adjusting screw located in the housing cover.

A steering gear identification tag is provided under one of the cover attaching bolts (Fig. 2).

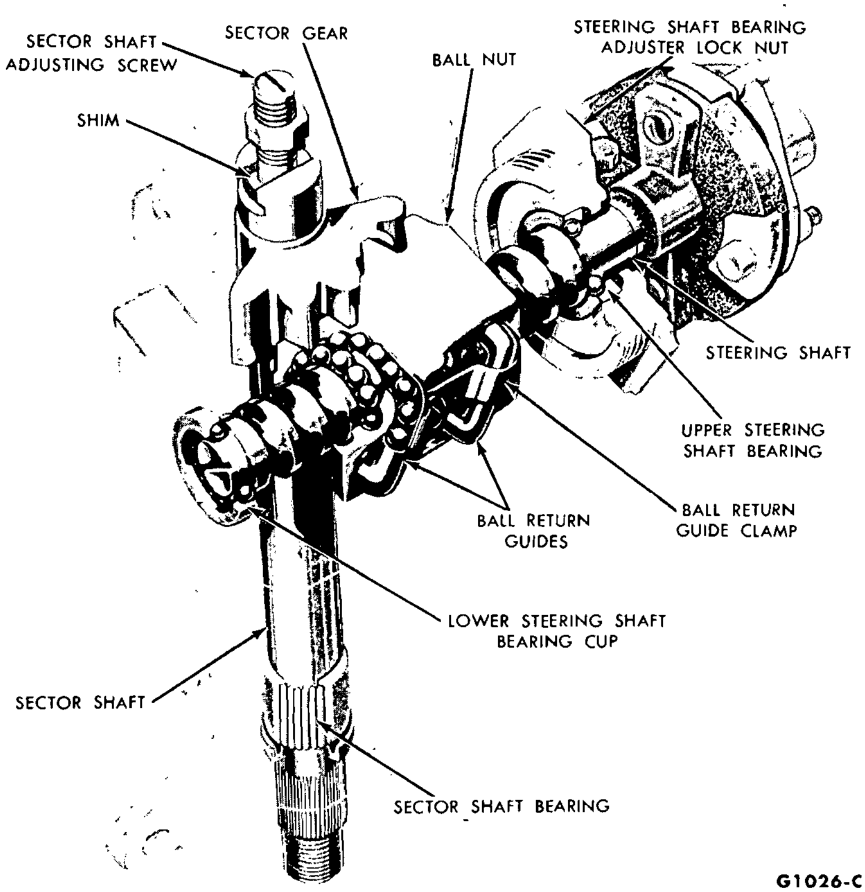


FIG. 1—Recirculating Ball Type Steering Gear—Typical

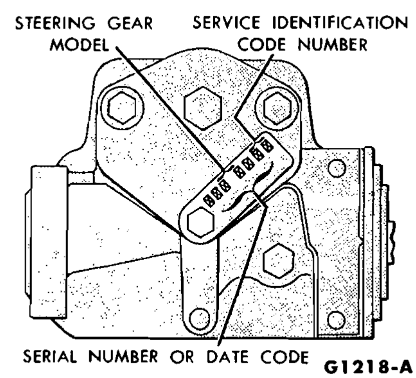


FIG. 2—Steering Gear Identification Tag

STATIONARY STEERING COLUMNS

The following has been incorporated in the stationary steering column.

1. Emergency flasher and lane changer turn signal incorporated in the hub of column.
2. Neutral start and back-up lamp switches mounted on steering column tube all except Mustang and Cougar.
3. Steering column-to-instrument panel attaching bracket is not integral with the column tube.

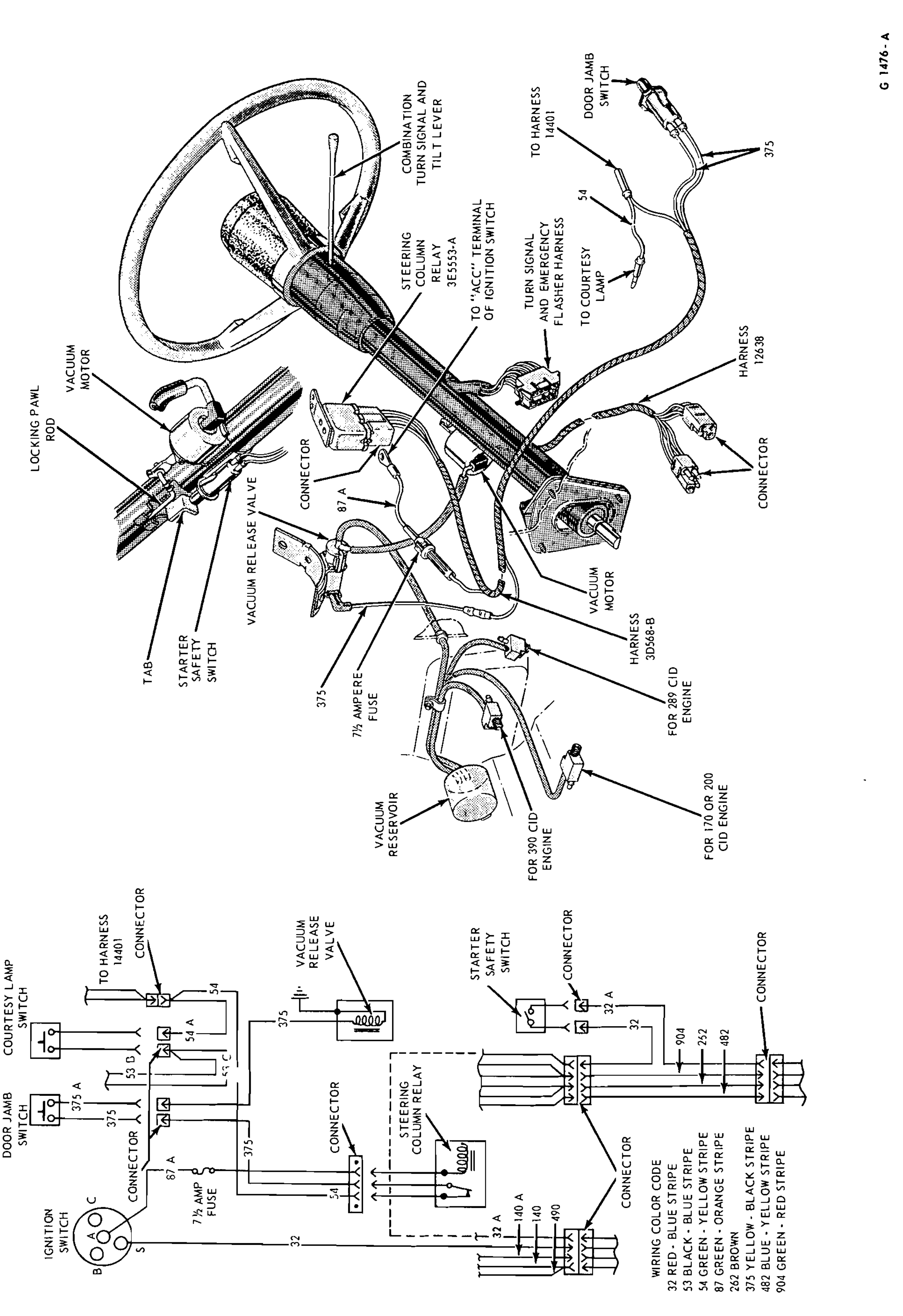


FIG. 3—**Tilt Column Vacuum and Electrical Systems**

4. The flex coupling has a large and a small drive lug so that it can be assembled only in one position.

TILT-AWAY STEERING COLUMN

DESCRIPTION

The tilt-away steering column features nine driving positions (four up and four down from a center position) and a tilt-away position that is automatically accomplished when the ignition key is turned to the OFF position and the left door is opened. This completes an electrical circuit through a switch in the left door jamb located just below the courtesy light switch and an electrically operated vacuum release valve mounted on the lower edge of the instrument panel approximately eight inches to the right of the steering column Fig. 3. The vacuum release valve is connected to a vacuum reservoir located on the right side of the dash panel in the engine compartment and to a vacuum motor located on the lower end of the steering column tube by rubber hoses. When the vacuum release valve is energized electrically, it opens a valve and allows reservoir vacuum to act on the vacuum motor diaphragm to pull the parking pawl out of the lower flange at the upper end of the column. Spring tension then moves the steering wheel upward and to the right at approximately a 45° angle (tilt-away position) at the steering shaft universal joint. The column will remain in the tilt-away position until the driver manually moves the column to the drive position after the left door has been closed.

The column will not move out of the driving position until the key is turned to the OFF position and the left door is opened, either operation first as long as both operations are performed.

Changing the column and steering wheel from one driving position to another can be made at any time by depressing the turn indicator control lever and holding it while selecting the desired driving position for the steering wheel. This releases the spring loaded steering column locking lever from the steering column locking index. The column and wheel are locked in position when the turn signal control lever is allowed to return rearward, with spring tension, to its neutral position. This indexes the lug on the steering column locking lever with the closest tooth on the locking index for the selected steering wheel position.

The column also features a turn signal switch with a lane-changer position, turn indicating position and emergency warning flasher control knob.

A starter safety switch located to the right of the vacuum motor on the steering column prevents the engine from being started while the steering wheel is in the tilt-away position. The starter safety switch is actuated by the locking pawl rod. A tab provided on the rod depresses the switch to open the starter motor circuit when the wheel is in the tilt position. When the steering wheel is placed in the drive position, the tab moves upward and allows the switch plunger to move outward and close the circuit.

The vacuum reservoir has a capacity to operate (cycle) the steering column for approximately three times after the engine has been shut down.

The turn signal switch control lever has a neutral (cancel On-Off) position from which the lever can be moved upward to indicate right turns, downward to indicate left turns and forward to release the steering column lock when adjusting the steering wheel to a desired driving position. As the turn signal control lever is moved slightly up or down when changing lanes, contact is made in the turn signal switch actuating the indicating system prior to reaching detent for full turn self-cancelling. The lever is held in this position and released when lane changing is completed, returning the lever to neutral position. The full travel of the lever to detent is for a complete left or right turn and automatically cancels on return of the steering wheel to straight-ahead position.

An emergency warning flasher system is integrated with the turn signal switch system. A control knob is located on the right side of the column just below the steering wheel and opposite the turn signal control lever. The emergency warning flasher system is ON when the control knob is pushed in and OFF when the knob is pulled out. When the system is ON the parking lights, stop lights and instrument panel turn indicating lights all flash simultaneously.

The following steering column repair operations can be performed in the vehicle:

. Starter safety switch. Switch Adjustment

. Steering wheel replacement

. Turn signal switch replacement

. Steering column and wheel assembly replacement

. Upper bearing replacement

. The following steering column repair operations must be made on the bench:

. Steering shaft replacement

. Tilt column locking pawl adjustment

2 IN-VEHICLE ADJUSTMENTS AND REPAIRS

HOISTING INSTRUCTIONS

Damage to suspension and/or steering linkage components may occur if care is not exercised when positioning the hoist adapters of 2 post hoists prior to lifting the vehicle.

If a 2 post hoist is used to lift the vehicle, place the adapters under the front suspension lower arms. **Do not allow the adapters to contact the steering linkage.**

STEERING GEAR WORM AND SECTOR ADJUSTMENTS

The ball nut assembly and the sector gear must be adjusted properly to maintain minimum steering shaft end play (a factor of preload adjustment) and minimum backlash between sector gear and ball nut. There are only two possible adjustments within the recirculating balltype steering gear, and **these should be made in the following order to avoid damage or gear failure.**

1. Disconnect the Pitman arm from the sector shaft.

2. Remove the steering wheel, spring and the centering cone from the shaft and note the relation of the shaft to the bearing.

3. If the shaft is not centered, attach a spring scale to it.

4. Center the shaft by pulling on the scale and note the reading.

5. If more than 20 lbs pull is required to center the shaft, the steering column should be aligned as detailed in steering gear installation, before adjusting the preload and mesh load.

6. Loosen the nut which locks the sector adjusting screw (Fig. 4), and turn the adjusting screw counterclockwise.

7. Measure the worm bearing preload by attaching an in-lb torque wrench to the steering wheel nut (Fig.

5). With the steering wheel off center, read the pull required to rotate the input shaft approximately 1 1/2 turns either side of center. If the torque or preload is not within specification (Part 3-6), adjust as explained in the next step.

8. Loosen the steering shaft bearing adjuster lock nut, and tighten or back off the bearing adjuster (Fig. 4) to bring the preload within the specified limits.

9. Tighten the steering shaft bearing adjuster lock nut, and recheck the preload.

10. Turn the steering wheel slowly to either stop. **Turn gently against the stop to avoid possible damage to the ball return guides.** Then rotate the wheel 2 1/4 turns to center the ball nut.

11. Turn the sector adjusting screw clockwise until the specified pull (Part 3-6) is necessary to rotate the worm past its center high spot (Fig. 5). **No perceptible backlash is permissable at 30° on either side of center.**

12. While holding the sector adjusting screw, tighten the locknut to specification and recheck the backlash adjustment.

13. Connect the Pitman arm to the sector shaft and torque to specification.

STEERING WHEEL SPOKE POSITION ADJUSTMENT

When the steering gear is on the high point, the front wheels should be in the straight-ahead position and the steering wheel spokes should be in their normal position with the Pitman arm pointing directly forward. If the spokes are not in their normal position, they can be adjusted without disturbing the toe-in adjustment (Refer to Part 3-1).

STEERING WHEEL REPLACEMENT

1. Disconnect the negative cable from the battery.

2. Turn the hub cap counterclockwise to disengage it from the steering wheel.

3. Remove steering wheel nut, and then remove the steering wheel with tool 3600-AA (Fig. 6). Removing the steering wheel with a knock-off type puller will cause damage to the steering column bearings.

4. Transfer all servicable parts to the new steering wheel.

5. Position the steering wheel on the shaft so that the alignment mark on the hub of the wheel is adjacent to the one on the shaft. Install and torque the nut to specification. Then, apply 2 drops of Loctite sealer (C3AZ-19554-A) to the joint of the nut and steering shaft threads.

6. Install the hub cap.

STATIONARY STEERING COLUMN REPAIRS

SHIFT TUBE REPLACEMENT

Comet, Falcon and Fairlane with Standard Transmission

Removal

1. Open the hood and insert a fabricated alignment tool (Group 6) through the column tube and shift arms to hold the shift mechanism in neutral.

2. Disconnect the turn signal and horn wires at the steering column connectors.

3. Remove the horn ring and spring from the steering wheel.

4. Remove the steering wheel attaching nut and remove the steering wheel with Tool 3600-AA (Fig. 6).

5. Remove the trunnion and springs retaining the shift lever in the socket and remove the shift lever.

6. Remove the turn signal switch lever.

7. Remove the emergency flasher control knob.

8. Remove 3 bearing retainer attaching screws and remove the bearing retainer and turn signal switch from the steering column (Fig. 7).

9. Lift the spring and centering sleeve from the steering shaft.

10. Loosen 2 flange bolt nuts that secure the flange to the steering column tube (Fig. 7).

11. Pull upward on the shift lever socket and remove the flange and shift lever socket from the steering column.

12. Lift the shift tube from the steering column.

Installation

1. Position the shift tube in the steering column and through the shift arms. **Be sure the shift tube is inserted through both shift arms.**

2. Position the shift lever socket on the steering column and engage it with the shift tube (Fig. 7).

3. Position the flange to the hub so that the heads of the 2 flange bolts engage in the slots of the steering column tube. Then, tighten the 2 flange bolt nuts.

4. Position the centering sleeve on the steering shaft and seat it into the flange bearing.

5. Feed the turn signal switch wires through the steering column

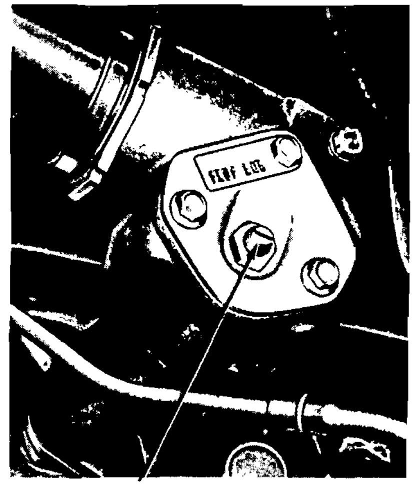


FIG. 4—Steering Gear Adjustments —Typical

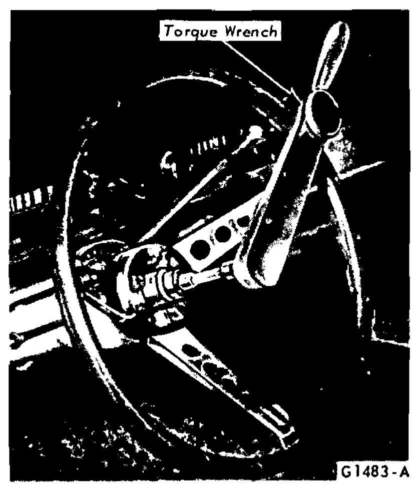


FIG. 5—Checking Pre-Load—Typical

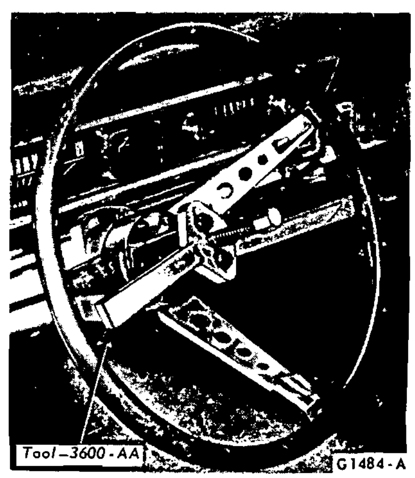


FIG. 6—Removing Steering Wheel—Typical

and position the switch and bearing retainer to the flange.

6. Install the 3 bearing retainer attaching screws.

7. Position the shift lever to the shift lever socket and install the springs and trunnion.

8. Apply 2 drops of Loctite sealer (C3AZ-19554-A) to the threads of the turn signal switch lever and install the lever.

9. Install the emergency flasher control knob.

10. Position the spring and steering wheel on the steering shaft and install the attaching nut. Torque the nut to specification and apply 2 drops of Loctite sealer (C3AZ-19554-A) to the junction of the nut and steering shaft threads.

11. Install the spring and horn ring or button on the steering wheel and connect the turn signal and horn wires at the connectors.

12. Adjust the shift linkage, if required, and remove the alignment tool.

Falcon with Automatic Transmission Comet and Fairlane with Automatic Transmission and Standard Steering

Removal

1. Open the hood and disconnect the shift rod from the steering column shift arm.

2. Loosen the steering gear to side rail attaching bolts.

3. Disconnect the turn signal and horn wires at the steering column connectors.

4. Remove the horn ring (or button) and spring from the steering wheel.

5. Remove the steering wheel attaching nut and remove the steering wheel with Tool 3600-AA (Fig. 6).

6. Remove the insulation from the dash panel in the area of the steering column.

7. Remove 5 dash panel seal retainer attaching screws (Fig. 7) and remove the seal from the steering column opening. Then, slide the seal up the steering column.

8. Remove 2 bolts attaching the steering column to the instrument panel support.

9. Apply tape to the area around the instrument panel steering column opening to protect the finish on the panel.

10. Place the transmission selector lever in the low gear position.

11. Turn the steering column 1/4 turn counterclockwise. Pull the steering column upward on the steering shaft until the shift arm contacts the dash panel in the engine compartment.

12. Rotate the steering column clockwise until the shift arm clears the opening in the dash panel. Then, pull upward on the column until the steering column attaching bracket clears the instrument panel. It may be necessary to apply a slight downward pressure on the steering column so the bracket will clear the instrument panel.

13. Rotate the steering column until the shift arm is pointing down and remove the column from the vehicle.

14. Place the steering column on a bench and move the transmission selector lever to the neutral position.

15. Remove the shift tube to steering column hub attaching screw located on the underside of the hub.

16. Pull the shift tube out of the steering column from the lower end.

Installation

1. Position the shift tube in the steering column and install the retaining screw.

2. Place the steering column over the steering shaft with the shift arm pointing down.

3. Slide the steering column down on the steering shaft until the bracket is near the instrument panel opening.

4. Rotate the steering column about 1/2 turn until the top of the steering column bracket is straight up and down on the left side of the column.

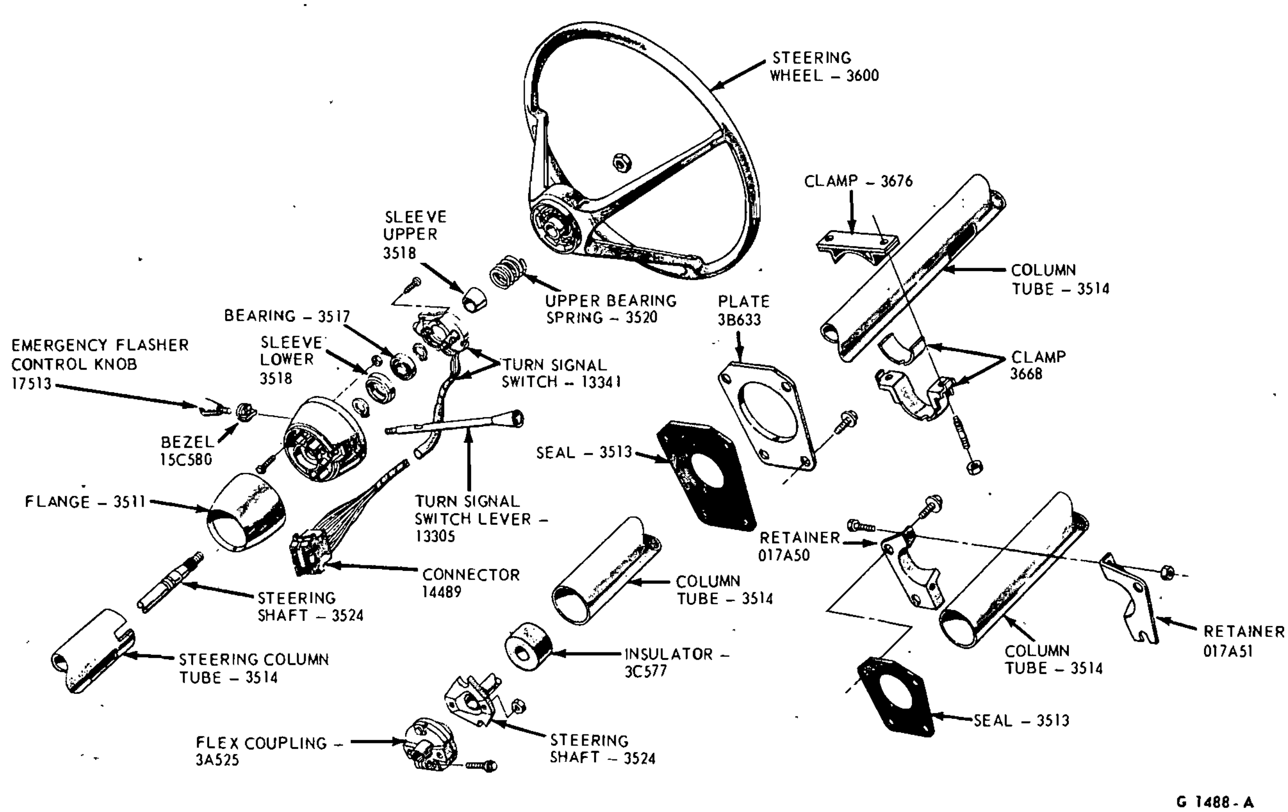


FIG. 7—Steering Column Disassembled— Typical

5. Slide the steering column down on the steering shaft until the shift arm contacts the dash panel. It may be necessary to apply a slight downward pressure to the steering column so the bracket will clear the instrument panel.

6. Rotate the steering column so the shift arm clears the dash panel opening and slide the column down until the shift arm is through the opening. Then, rotate the steering column so that the steering column bracket is in position at the instrument panel support bracket.

7. Loosely install the 2 steering column bracket to support bracket attaching bolts (Fig. 7).

8. Position the seal and retainer to the steering column and dash panel and install the attaching screws (Fig. 7).

9. Position the upper bearing sleeve and spring on the steering shaft.

10. Position the steering wheel on the steering shaft and install the retaining nut. Torque the nut to specification and apply 2 drops of Loctite sealer (C3AZ-19554-A) to the junction of the nut and steering shaft threads.

11. Install the spring and horn ring (or button) on the steering wheel.

12. Connect the horn and turn signal wires at the multiple connector.

13. Connect the shift linkage to the shift arm.

14. Torque the steering gear attaching bolts to specification.

15. Torque the steering column bracket to support brace attaching bolts to specification.

16. Check and adjust the shift linkage as required.

Comet and Fairlane with Automatic Transmission and Power Steering

Removal

1. Open the hood and disconnect the shift linkage from the steering column shift arm.

2. Remove 2 bolts and nuts that attach the flex coupling to the steering shaft.

3. Disconnect the turn signal and horn wires at the steering column connectors.

4. Remove the horn ring (or button) and spring from the steering wheel.

5. Remove the steering wheel retaining nut and remove the steering wheel with Tool 3600-AA (Fig. 6).

6. Remove the insulation from the dash panel in the area of the steering column.

7. Remove 2 screws clamping the dash panel seal retainer to the steering column. Then, remove 5 screws attaching the retainer to the dash panel and remove the retainer.

8. Remove 2 bolts attaching the steering column to the instrument panel support and remove the steering column from the vehicle.

9. Remove the snap ring from the steering shaft and remove the steering shaft from the steering column.

10. Place the selector lever in the neutral position and remove the shift tube to steering column hub attaching screw located on the underside of the hub.

11. Pull the shift tube out of the lower end of the steering column.

Installation

1. Position the shift tube in the steering column and install the retaining screw.

2. Insert the steering shaft in the steering column and place the upper bearing sleeve on the upper end of the column. Install the spring and nut on the steering shaft to secure the shaft in the column.

3. Position the steering column in the care and loosely install the steering column to instrument panel support bolts.

4. Install the 2 bolts and nuts attaching the flex joint to the steering shaft.

5. Position the dash panel opening seal and retainer to the dash panel and install the 7 attaching screws.

6. Install the insulation to the dash panel in the area of the steering column.

7. Remove the nut from the steering shaft and position the steering wheel on the shaft. Install the attaching nut and torque to specification (Part 3-6).

8. Apply 2 drops of Loctite sealer (C3AZ-19554-A) to the junction of the steering shaft and nut threads.

9. Torque the steering column to instrument panel attaching bolts to specification (Part 3-6).

10. Install the horn ring and spring and connect the turn signal and horn wires at the connector.

11. Connect the shift linkage to the steering column shift arm and adjust as required.

STEERING COLUMN UPPER BEARING REPLACEMENT

Comet and Fairlane with Automatic Transmission or Floor Shift with Power Steering

1. Disconnect the horn wire and the turn indicator wires at the connectors. Remove the horn ring (or button) and the spring.

2. Remove the steering wheel attaching nut. Remove the steering wheel (Fig. 6) with a puller.

3. Remove the turn indicator lever. Remove the upper bearing retainer screws and move the turn signal switch to one side.

4. Remove 1 bolt clamping the flex coupling on the steering shaft.

5. Remove the snap ring from the steering shaft.

6. Pull up on the steering shaft to remove the bearing from the flange and remove the bearing from the steering shaft.

7. Lubricate the bearing and position it on the steering shaft. Use Tool T62F-3576-A to seat the bearing, if necessary.

8. Install the snap ring on the steering shaft.

9. Install the flex coupling clamp bolt.

10. Position the turn signal switch and bearing retainer to the flange and install the 3 attaching screws.

11. Apply 2 drops of Loctite sealer (C3AZ-19554-A) to the turn signal switch lever and install the lever.

All Models Except Comet and Fairlane with Power Steering

1. Disconnect the horn wire and the turn indicator wires at the connectors. Remove the horn ring (or button) and the spring.

2. Remove the steering wheel attaching nut. Remove the steering wheel (Fig. 6) with a puller, Tool 3600-AA.

3. Remove the 3 bearing retainer screws and remove the bearing retainer.

4. Remove the emergency flasher control knob.

5. Lift the turn signal switch up and over the steering shaft and position it to one side.

6. Remove the centering sleeve and spring from the steering shaft.

7. Remove 2 flange bolt nuts (Fig. 7) and lift the flange from the steering column.

8. Place a socket of the correct diameter in the steering shaft opening of the flange and drive the bearing out of the flange from the bottom side.

9. Position the 2 flange bolts in the flange holes. Start the flange bolt nuts on the flange bolts about 1 1/2 turns.

10. Position the flange to the column so that the heads of the 2 flange bolts engage in the slots of the steer-

ing column tube. Then, tighten the 2 flange bolt nuts.

11. Lubricate the bearing and install it in the flange.

12. Install the emergency flasher control knob.

13. Position the turn signal switch and bearing retainer to the flange and install the 3 retaining screws.

14. Install the centering sleeve and spring on the steering shaft.

15. Position the steering wheel on the steering shaft and install the retaining nut. Torque the nut to specification and apply 2 drops of Loctite sealer (C3AZ-19554-A) to the junction of the nut and steering shaft threads.

16. Install the horn ring (or button) and spring on the steering wheel.

17. Connect the turn signal and horn wires at the connectors and check the operation of both units.

TILT-AWAY STEERING COLUMN REPAIRS

STARTER SAFETY SWITCH ADJUSTMENT

1. Close the left door and make certain that the ignition key is in the OFF position.

2. Place the steering wheel in the drive position making sure that the locking pawl is fully engaged.

3. Check the distance betweeen the locking pawl pad and the starter safety switch (Fig. 8).

4. If not within specifications, loosen the switch bracket attaching screws and slide it upward to decrease the distance or downward to increase the distance. Tighten the attaching screws.

5. Check the switch operation. The engine should not start with the left door closed and the steering wheel in the tilt-away position.

UPPER BEARING REPLACEMENT

Removal

1. Disconnect the negative cable.

2. Remove the steering wheel with steering wheel puller 3600-AA and install the spring, steel shipping spacer (3/4 x 1 1/8-inch pipe) and the steering wheel attaching nut. The shipping spacer will prevent damaging the two ball bearings at the upper end of the shaft. **Do not use a knock-off type puller. This type of puller will damage the bearings.**

3. Slide the lower cover (Fig. 9) downward on the steering column.

4. Remove the turn signal wire retaining clip from the upper end of the steering column tube.

5. Remove the screws that attach the upper cover to the tilt mechanism. Slip the cover off the pivot cover.

6. Remove the two screws that attach the turn signal switch to the steering column. Move the switch wires upward enough to permit lifting the switch over the end of the steering shaft and lay the switch to one side. Be careful not to lose the turn signal lever pivot from the switch.

7. Compress the steering column locking clamp with vise grip pliers (Fig. 10) and move to the full up position.

8. Hold the column position spring rod with vise grip pliers to prevent flotation, then compress the spring and remove the retainer. Remove the plastic cover and spring.

9. Install tool T67P-3D739-A as shown in Fig. 10. Thread the bolt inward **finger tight** until it bottoms, then back it out one full turn. Make sure that the handle is centered over the pivot pin to prevent bolt breakage. Hold the 3/8 inch bolt head stationary, then tighten the nut to extract the pin. Repeat this operation on the opposite pin.

10. Remove the nut, shipping spacer and spring from the steering shaft.

11. With the steering column lock-

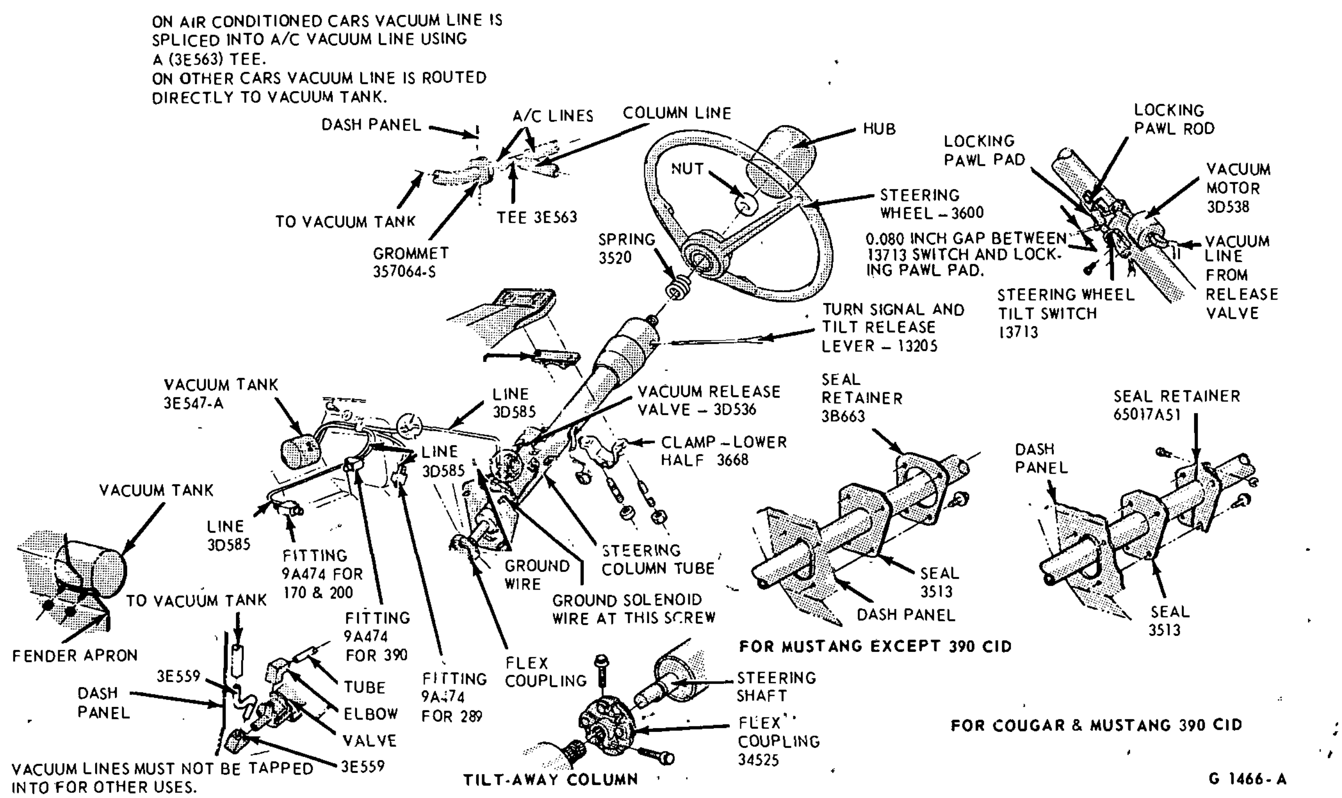


FIG. 8—Steering Column Installation

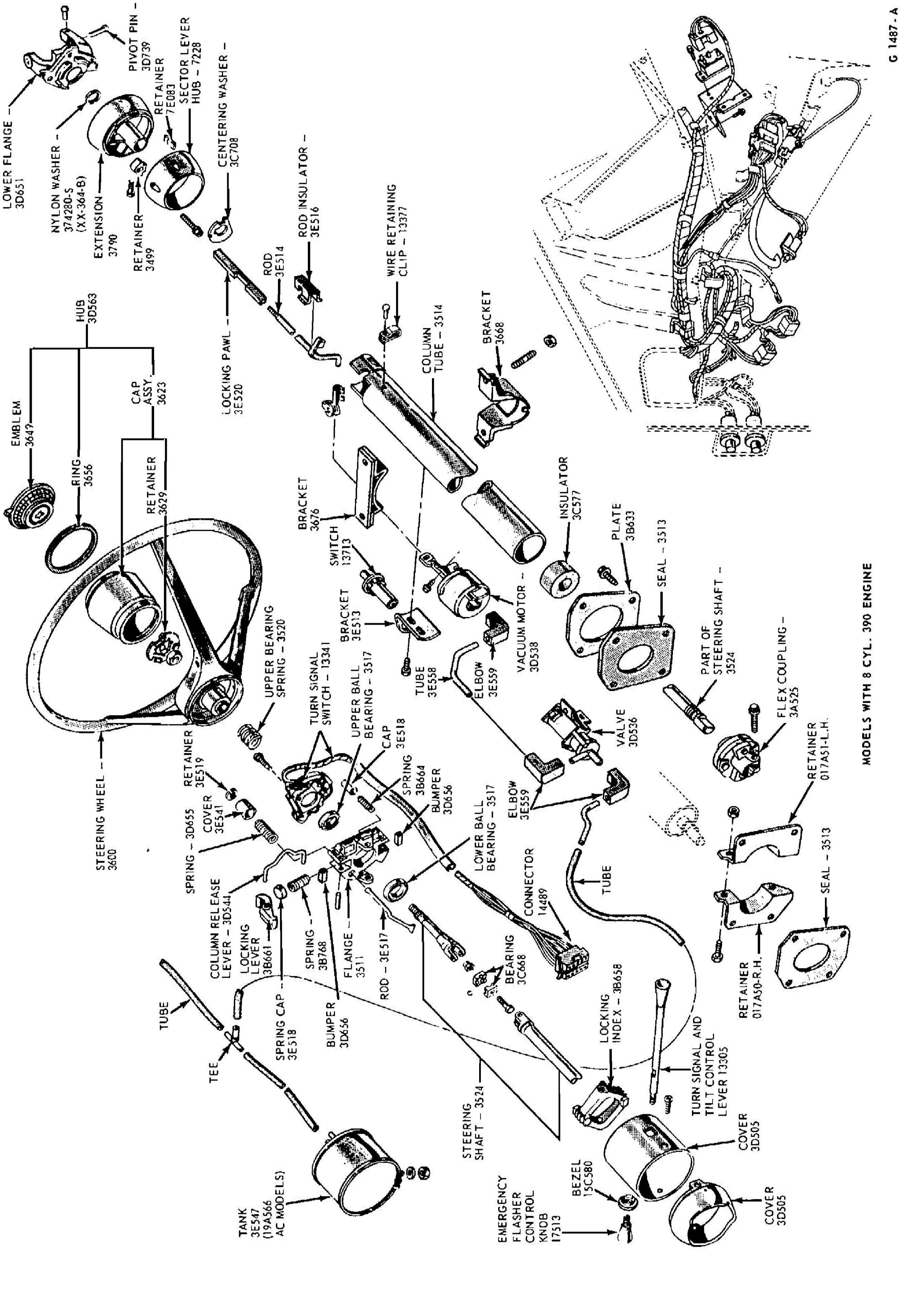


FIG. 9—Steering Column and Related Parts—Disassembled

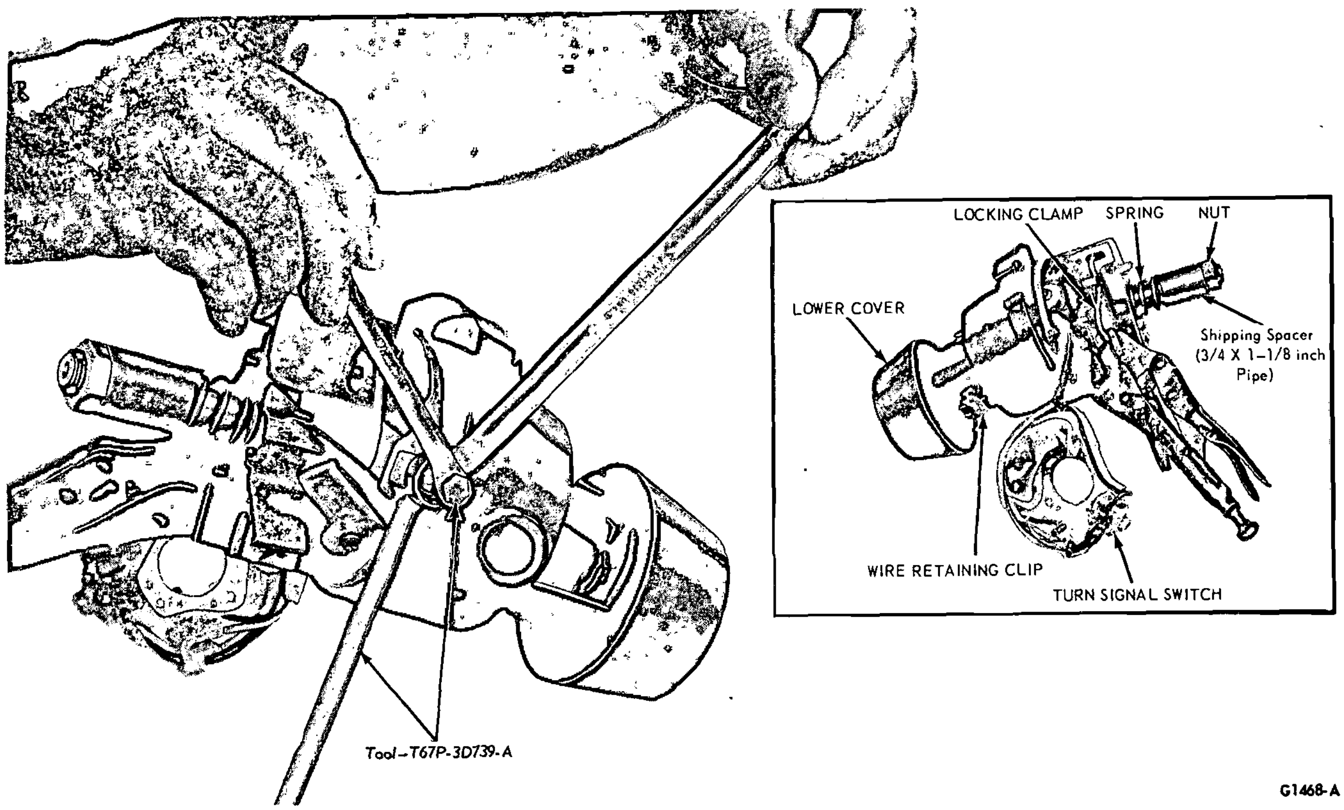


FIG. 10—Removing Tilt Mechanism Pivot Pin

ing clamp still compressed, lift the upper flange from the column by working against the lower bearing inner race. Care must be taken when removing the flange, since upward movement may pop out the lower bearing inner race. Downward movement may pop out the upper bearing inner race.

12. Place the flange on the bench with the smaller bearing toward the bench (Fig. 11). Drive lightly on the outer race at each slot with a small pick.

13. To remove the upper bearing invert the flange and remove the larger bearing in the same manner. **Never drive or apply pressure to the inner race.**

Installation

1. Apply a light film of COAZ-19584-A lubricant to the bearings.

2. Select a socket wrench that is the same diameter of each bearing outer race. Position the bearing on the upper flange with the open side facing inward. Place the socket on the outer race and tap the bearing into place. **Be careful not to contact the bearing inner race or the ball section, as damage will result.**

3. Compress the column release lever with vise grips to place the locking levers in the release position.

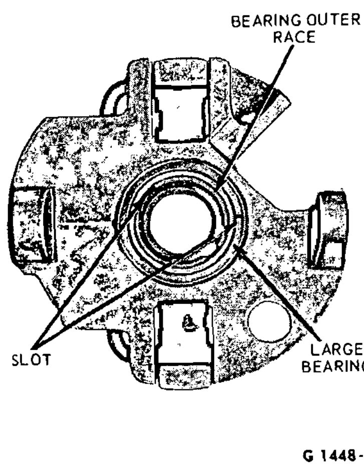


FIG. 11—Removing Upper Flange Bearings

4. Position the flange on the upper end of the shaft being careful to apply pressure only on the upper bearing inner race to prevent bearing damage.

5. Install the pivot pins as shown in Fig. 12 with a C-clamp. The pivot pins should have a clearance of 0.005 inch between the shoulder and casting when properly installed. A clearance of less than 0.005 inch may create a bind in the tilt mechanism. If one pin presses in before the other, place a spacer washer over the head of the pin that has already positioned to prevent over pressing while still pressing the other one into position.

6. Move the tilt mechanism to the upper most position and remove the vise grip pliers to lock it in place.

7. Position the release spring rod and hold it up as high as possible with vise grip pliers. Place the spring and cover in place on the upper flange. Compress the spring and install the retainer. Remove the vise grip pliers.

8. Depress the column release lever with pliers and place the tilt mechanism in the center position.

9. Position the turn signal switch and install the two attaching screws.

10. Pull the wires into place and install the plastic retaining clip.

11. Slide the lower cover into place making sure that the three retaining clips engage the slots in the selector lever hub.

12. Position the upper cover on the pivot cover and install the attaching screws.

13. Install the combination turn signal and tilt mechanism lever.

14. Install the emergency flasher control knob.

15. Install the steering wheel and hub.

16. Connect the negative cable to the battery. Check the turn signal and tilt mechanism for proper operation.

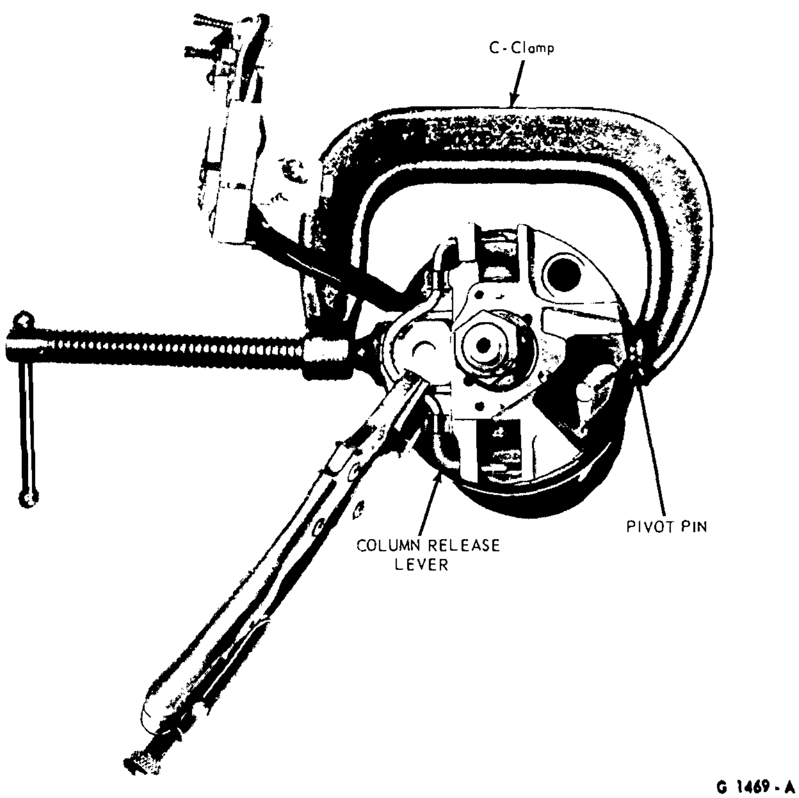


FIG. 12—Installing Upper Flange Pivot Pins

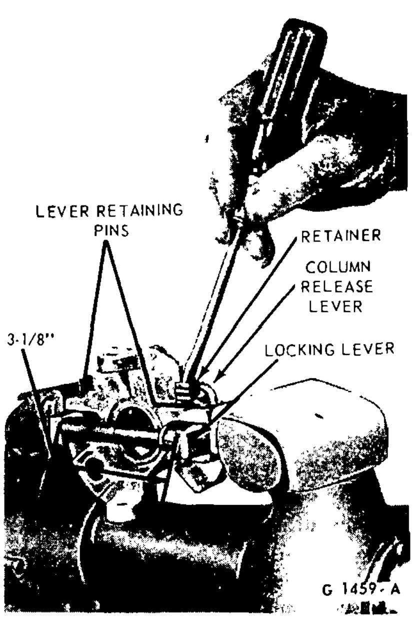


FIG. 13—Removing or Installing Locking Levers

VACUUM MOTOR REPLACEMENT

Removal

1. Disconnect the vacuum hose from the lower end of the motor Fig. 3.
2. Lift the retaining clip from the lower end of the locking pawl rod, then slide the rod out of the vacuum motor push rod. Remove the retaining clip.
3. Remove the two vacuum motor attaching screws and remove the motor from the column.

Installation

1. Position the vacuum motor on the column so that the retaining slot on the lower end engages the steering column tube. Install but do not tighten the two attaching screws.
2. Hold the locking pawl rod retaining clip in place on the vacuum motor rod and insert the locking pawl rod in the clip and vacuum motor rod. Snap the retaining clip into place.
3. Slide the vacuum motor as required to align the locking pawl rod and vacuum motor. Tighten the two vacuum motor attaching screws.
4. Connect the vacuum hose to the vacuum motor.

VACUUM RELEASE VALVE REPLACEMENT

Removal

1. Disconnect the wire from the vacuum release valve terminal Fig. 3.
2. Disconnect the two vacuum hoses from the release valve.
3. Remove the bolt that attaches the vacuum release valve mounting bracket to the lower edge of the instrument panel. Remove the vacuum release valve and mounting bracket.

Installation

1. Position the vacuum release valve on the lower edge of the instrument panel so that the mounting bracket points upward and the one connector points toward the steering column. Secure the release valve bracket with the attaching bolt.
2. Connect the wire to the terminal at the rear of the valve.
3. Connect the reservoir hose to the connector at the rear of the valve. Connect the vacuum motor hose to the connector that points toward the steering column.
4. Start the engine and check the steering column operation.

STARTER SAFETY SWITCH REPLACEMENT

Removal

1. Disconnect the two plug in type wires from the rear of the starter safety switch located on the right side of the column (Fig. 3).
2. Remove the two switch attaching screws and remove the switch and bracket.
3. Remove the switch from the bracket.

Installation

1. Assemble the starter safety switch in the bracket.
2. Position the starter safety switch and bracket on the column tube and install but do not tighten the screws.
3. Place the steering wheel in the drive position and slide the switch forward or back on the steering column tube to establish a clearance of 0.080

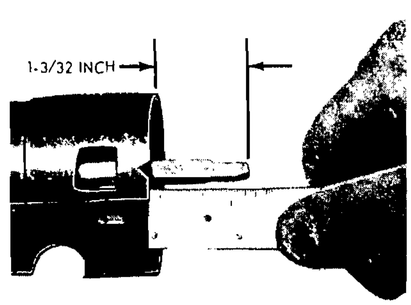


FIG. 14—Adjusting Locking Pawl

inch gap between the tab on the locking pawl rod and the switch plunger, then tighten the two attaching screws.

4. Connect the two wires to the rear of the switch being careful not to disturb the position of the switch in the bracket.

LOCKING LEVER REPLACEMENT

Removal

1. Remove the upper flange and bearings from the column.

2. Insert a 3 1/8-inch bolt between the lower ends of the locking levers (Fig. 13) to relieve the tension from the column release lever.

3. Place the flange in a vise as shown (Fig. 13) and remove the two retainers with a screwdriver.

4. Lift the column release lever from the flange.

5. Drive the locking lever retaining pins from the flange with a small drift.

6. Release the vise slowly to prevent the levers from flying out.

7. Remove the levers, spring caps and springs from the flange (Fig. 9).

Installation

1. Make sure that the rubber insulators are in place in the upper flange.

2. Position the springs, spring caps and locking levers in the upper flange.

3. Place the assembly in a vise and compress the springs. Install the lever retaining pins in the upper flange.

4. Install a 3 1/8-inch bolt between the lower ends of the locking levers as shown in Fig. 13.

5. Make sure that the column release lever stop is in place in the upper flange, then position the column release lever on the flange. Install the two retainers.

6. Remove the 3 1/8-inch bolt from between the levers.

7. Install the upper flange and bearings in the steering column.

LOCKING PAWL ADJUSTMENT

1. Remove the steering wheel and install the spring, shipping spacer (3/4 x 1 1/8-inch pipe) and nut on the steering shaft. Remove the steering column from the vehicle.

2. Remove the combination turn signal and tilt mechanism control lever. Remove the emergency flasher control knob. Remove the upper cover (Fig. 9).

3. Slide the lower cover downward on the steering column tube.

4. Remove the turn signal wire retaining clip from the steering column tube.

5. Remove the turn signal switch attaching screws. Work the switch wires upward enough to permit removing the switch over the end of shaft.

6. Remove the three Allen head screws, lock washers and retainers that secure the lower flange to the steering column tube (Fig. 9).

7. Remove the steering shaft and tilt mechanism as an assembly.

8. Lift the hub from the steering tube just enough to permit access to the locking pawl.

9. Rotate the pawl as required to obtain a distance of 1 3/32 inches from the top of the pawl to the upper end of the tube (Fig. 14).

10. Position the hub on the tube.

11. Install the steering shaft and tilt mechanism in the column.

12. Secure the lower flange to the tube with three retainers, Allen head screws and 1/2 inch OD lock washers.

13. Install the turn signal switch on the flange and secure it in place with two attaching screws.

14. Position the turn signal wires properly and install the retaining clip.

15. Slide the lower cover into place making sure that the three retaining clips engage the slots in the hub.

16. Install the upper cover on the pivot cover.

17. Install the combination turn signal switch and tilt mechanism control lever.

18. Install the emergency flasher control knob.

19. Install the steering column in the vehicle.

20. Remove the shipping spacer and install the steering wheel and hub.

21. Connect the negative battery cable to the battery.

22. Check the operation of the steering column.

STEERING SHAFT REPLACEMENT

Removal

1. Remove the steering wheel and install the spring, shipping spacer (3/4 x 1 1/8-inch pipe) and steering wheel attaching nut.

2. Remove the steering column from the vehicle.

3. Remove the combination turn signal and tilt mechanism lever.

4. Remove the emergency flasher control knob.

5. Remove the upper cover attaching screws and remove the cover.

6. Slide the lower cover down on the steering column tube.

7. Remove the turn signal switch wire, plastic retaining clamp.

8. Remove the two turn signal switch attaching screws. Lift the switch and wires just high enough to clear the top of the steering shaft. Remove the plate (Fig. 9).

9. Working from the underside of the hub, remove the three Allen head screws, lock washers and retainers.

10. Remove the plastic tapered bushing from the lower end of the steering shaft.

11. Lift the tilt mechanism and steering shaft from the steering column tube.

12. Remove the pivot pins as detailed under Upper Bearing Replacement. Remove the upper flange, lower flange, locking index and pivot cover from the shaft.

Installation

1. Position the locking index, lower flange and pivot cover on the steering shaft.

2. Install the upper flange as detailed under Upper Bearing Replacement. A vise can be used to install the pivot pins instead of a C-clamp since the steering shaft is removed from the column tube.

3. Install the steering shaft in the column tube.

4. Secure the lower flange to the tube with the three Allen head screws, retainers and 1/2 inch OD lock washers.

5. Install the tapered plastic bushing on the lower end of the steering shaft.

6. Position the plate and turn signal switch on the upper flange and install the two attaching screws.

7. Work the wires down into place and install the plastic retaining clamp.

8. Slide the lower cover into place making sure that the three spring clips engage the slots on the hub.

9. Install the upper cover on the pivot cover and install the two attaching screws.

10. Install the emergency flasher control knob.

11. Install the steering column in the vehicle.

12. Install the steering wheel.

3 REMOVAL AND INSTALLATION

HOISTING INSTRUCTIONS

Damage to suspension and/or steering linkage components may occur if care is not exercised when positioning the hoist adapters of 2 post hoists prior to lifting the vehicle.

If a 2 post hoist is used to lift the vehicle, place the adapters under the front suspension lower arms. **Do not allow the adapters to contact the steering linkage.**

STEERING GEAR

MUSTANG AND COUGAR

Removal

1. Disconnect the horn and turn indicator wires under the instrument panel.

2. Remove the horn ring (or button). Remove the steering wheel attaching nut and the steering wheel (Fig. 6).

3. Remove the upper bearing centering sleeve and spring.

4. Remove the steering column clamp to instrument panel bolts and remove the clamp and the insulator.

5. Pull the rubber seal up on the steering column, fold the floor mat aside, and move the dash panel insulation out of the way.

6. Remove the attaching screws from the steering column weather seal on the dash panel. Remove the steering column cover plates and gasket.

7. Slide the steering column tube assembly from the steering gear shaft, guiding the shift lever(s) up through the opening in the dash panel.

8. Raise the vehicle and remove the clutch equalizer and bracket assembly from the frame side rail and engine if so equipped to obtain clearance.

9. On power steering equipped vehicles, remove pal nut attaching nut insulator and washer and remove the power steering cylinder rod from the bracket to obtain clearance for removal of Pitman arm.

10. Remove the inlet pipe from the manifold to obtain clearance.

11. Remove nut and washer. Install Tool T64P-3590-F and remove the Pitman arm from the sector shaft (Fig. 15).

12. Remove steering gear attaching bolts.

13. Lower the vehicle and disconnect the wires from the left bank of spark plugs to prevent damaging them.

14. Remove brake booster if necessary.

15. Remove the support rod from cowl to spring tower.

16. Loosen air cleaner to obtain clearance if necessary.

17. Lift the steering gear and shaft assembly from the engine compartment by raising the gear up and forward past the engine and spring tower taking care not to soil or tear the front seat fabric with the end of the steering shaft.

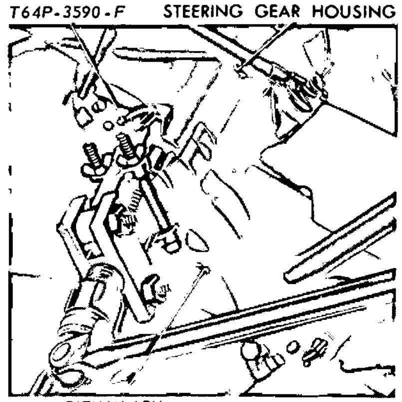


FIG. 15—Removing Pitman Arm—Typical

Installation

1. Install the steering gear from engine side and guide the shaft through the dash panel being careful not to soil or tear the front seat fabric. Install the steering gear attaching bolts but do not tighten.

2. Center the steering shaft for straight ahead drive position.

3. Raise vehicle on hoist and install clutch equalizer assembly to engine and underbody if vehicle is so equipped.

4. Install inlet pipe to manifold.

5. Install Pitman arm to the sector shaft and install the lock washer and the torque nut to specification.

6. If equipped with power steering, install power cylinder rod to bracket and install insulator washer and nut.

7. Partially lower vehicle onto safety stands and install the steering column tube assembly over the steering shaft, guiding the shifting arms through the opening in the dash panel.

8. Position the steering column assembly and retaining clamp and insulator, and loosely install the attaching bolts and nuts.

9. Tighten the steering gear to side rail mounting bolts and column to instrument panel retaining bracket.

Check steering shaft to column upper bearing clearance. If the shaft does not touch the bearing, no further readjustment is required. If the shaft is touching the column upper bearing, it will be necessary to check the pull required to center the shaft in the column, using a pull scale. Where pull exceeds 20 lbs at either plane to center the shaft in the column, the following correction must be made:

Vertical movement of the steering shaft can be accomplished by loosening the steering gear mounting bolts and pivoting the gear up and down.

Horizontal movement of the steering shaft can be accomplished by loosening the steering column to instrument panel attaching bracket and moving the column to the left or right.

Should additional horizontal movement be required to align the steering shaft, it will be necessary to insert shim(s) of proper thickness between the steering gear assembly and the vehicle side rail. Front end alignment shims can be used for this purpose. After the steering shaft is centered, torque all bolts to specification.

10. Position the upper bearing centering sleeve and spring. After applying Lubriplate to the upper surface of the steering shaft upper bearing and the horn switch brush plate, position the steering wheel on the steering shaft and install the attaching nut. Torque the nut to specification. Then, apply 2 drops of Loctite sealer (C3AZ-19554-A) to the junction of the steering shaft and the attaching nut threads.

Apply Loctite sealer sparingly to the turn indicator lever threads and install the lever.

11. Install the horn ring (or button) and spring, and steering wheel to the center point.

12. Set gap between column tube and steering wheel and tighten column to instrument panel.

13. Lower the vehicle from the safety stands. Connect the horn, turn indicator wires, and (on a vehicle with an automatic transmission) the neutral switch wires.

14. Position the steering column cover plates and gasket on the dash panel and install the attaching screws.

15. Position the dash panel insulation just above the steering column.

Position the floor mat and push the rubber seal down to the floor mat.

16. Connect cowl to spring tower support rod.

17. Tighten the air cleaner.

COMET AND FAIRLANE WITH STANDARD STEERING (EXCEPT 390 CID ENGINE) AND ALL FALCON

Removal

1. Disconnect the turn signal and horn wires at the steering column connectors.
2. Remove the horn ring from the steering wheel.
3. Remove the steering wheel retaining nut and remove the steering wheel with Tool 3600-AA (Fig. 6).
4. Remove 5 steering column retainer attaching screws and remove the retainer from the steering column and dash panel (Fig. 7). Slide the seal up the steering column.
5. Remove the 2 steering column clamp to instrument panel support attaching bolts.
6. Remove the upper bearing centering sleeve and spring from the steering shaft.
7. Disconnect the shift linkage from the steering column shift arms.
8. Raise the vehicle and remove the Pitman arm attaching nut and remove the Pitman arm with Tool T64P-3590-F (Fig. 15).
9. Remove the nut attaching the clutch release arm return spring bracket and remove the bracket and spring (Standard transmission vehicle only).
10. Remove the 3 steering gear to frame side rail attaching bolts.
11. Lower the vehicle and remove the steering column from the steering shaft.
12. Remove the steering gear from the vehicle.

Installation

1. Position the steering gear in the vehicle and allow it to rest on the frame side rail.
2. Position the steering column over the steering shaft and through the hole in the dash panel.
3. Install the steering grear attaching bolts and the clutch release arm return spring, bracket, and nut.
4. Install the Pitman arm and retaining nut and washer on the sector shaft. Torque the nut to specification.
5. Position the steering column to the instrument panel and install the 2 attaching bolts. Do not tighten the bolts at this time.
6. Position the seal and retainer to the dash panel opening and install the attaching screws.
7. Position the upper bearing sleeve, spring, and steering wheel on the steering shaft and install the attaching nut (Fig. 7). Torque the nut to specification and apply 2 drops of Loctite sealer (C3AZ-19554-A) to the junction of the steering shaft and retaining nut threads.
8. Adjust the steering wheel to flange clearance to 3/64 inch and tighten the steering column clamp to instrument panel attaching bolts. Torque the bolts to specification (Part 3-6).
9. Install the spring and horn ring (or button) on the steering wheel.
10. Connect the turn signal and horn wires at the steering column connectors.
11. Connect the shift rods to the steering column shift arms.
12. Torque the steering gear attaching bolts to specification (Part 3-6) and fill the steering gear with the specified lubricant to the correct level (Part 3-1).

COMET AND FAIRLANE WITH POWER STEERING

Removal

1. Open the hood and remove 2 bolts and nuts attaching the flex coupling to the steering shaft.
2. Raise the vehicle and remove 3 bolts and a nut attaching the power cylinder bracket to the frame side rail. Separate the bracket from the side rail and allow the cylinder and bracket to hang.
3. Remove the Pitman arm attaching nut and washer and remove the Pitman arm from the sector shaft with Tool T64P-3590-F (Fig. 15).
4. Remove the nut attaching the clutch release arm return spring bracket and remove the bracket and spring (Standard transmission vehicles only).
5. Remove 3 steering gear attaching bolts and remove the steering gear.

Installation

1. Position the steering gear to the frame side rail and the flex coupling to the steering shaft and install the 3 steering gear attaching bolts. Torque the bolts to specification (Part 3-6).
2. Install the clutch release arm return spring and bracket (Standard transmission vehicles only).
3. Position the Pitman arm to the sector shaft and install the washer and attaching nut. Torque the nut to specification (Part 3-6).
4. Position the power cylinder bracket to the side rail and install the 3 attaching bolts and nut. Torque the bolts and nut to specification (Part 3-6).
5. Lower the vehicle and install the 2 flex coupling to steering shaft attaching bolts and nuts.
6. Fill the steering gear with the specified lubricant to the correct level (Part 3-1).

COMET AND FAIRLANE WITH 390 CID ENGINE AND STANDARD STEERING

Removal

1. Raise the vehicle and remove the Pitman arm attaching nut and washer.
2. Remove the Pitman arm from the sector shaft with the tool shown in Fig. 15.
3. Remove the 3 steering gear to side rail attaching bolts and disconnect the shift rods from the shift levers.
4. Lower the vehicle and disconnect the horn and turn signal wires at the steering column multiple disconnects.
5. Remove the horn button or ring from the steering wheel, and remove the steering wheel attaching nut.
6. Remove the steering wheel from the steering shaft with Tool 3600-AA. Then, remove the tool from the steering wheel.
7. Remove 5 screws attaching the steering column opening seal and retainer to the dash panel. Remove the retainer and slide the seal up the steering column.
8. Remove 2 steering column clamp to instrument panel attaching bolts and lift the steering column from the steering shaft.
9. Open the hood and disconnect the master cylinder lines from the cylinder.
10. Remove the brake master cylinder attaching bolts and remove the master cylinder from the dash panel.
11. Disconnect the spark plug wires from numbers 5 through 8 spark plugs, and remove the rocker cover from the left cylinder head.
12. Remove 3 steering gear housing cover attaching bolts and remove the housing cover from the steering gear.
13. Remove the steering gear from the vehicle as follows:

a. Place the steering gear output shaft against the fender apron.

b. Pull the steering gear up and over the spring tower and remove the steering gear from the vehicle.

Installation

1. Remove the steering gear housing cover from the steering gear.
2. Position the steering gear in the car as follows:
a. Insert the steering shaft through the opening in the dash panel.
b. Point the output shaft toward the fender apron. Slide the gear downward and position it to the frame side rail.
3. Install the steering gear housing cover on the gear housing and adjust the steering gear (Section 2).
4. Position the steering column over the steering shaft and loosely install the steering column clamp to instrument panel attaching bolts.
5. Position the steering column opening seal and retainer to the dash panel and install the attaching screws.
6. Center the steering gear midway between a full right and full left turn and position the steering wheel on the steering shaft and install the attaching nut.
7. Torque the nut to specification and apply 2 drops of Loctite sealer (C3AZ-19554-A) to the junction of the nut and steering shaft threads.
8. Install the horn button or ring and the spring to the steering wheel.
9. Install the rocker cover on the left cylinder head and connect the spark plug wires to the spark plugs (Group 8).
10. Position the brake master cylinder to the dash panel and install the attaching bolts.
11. Connect the brake master cylinder lines to the cylinder.
12. Raise the vehicle and install the steering gear to side rail attaching bolts. Torque the bolts to specification (Part 3-6).
13. Position the Pitman arm to the sector shaft and install the attaching nut. Torque the nut to specification (Part 3-6).
14. Bleed the brake hydraulic system (Part 2-1).
15. Connect the shift rods to the shift levers.
16. Lower the vehicle and torque the steering column clamp to instrument panel attaching bolts.
17. Connect the horn and turn signal wires at the steering column multiple connectors.

STEERING COLUMN REPLACEMENT

REMOVAL

1. Disconnect the negative cable from the battery.
2. Remove the bolt that attaches the flexible coupling to the steering shaft.
3. Remove the four screws that attach the steering column tube flange to the dash panel (Fig. 8).
4. Disconnect the vacuum hose from the vacuum motor and safety wires from the switch (tilt-away column only).
5. Disconnect the turn signal switch wires at the connectors.
6. While supporting the steering column, remove the two nuts that attach the column to the instrument panel. Lift the column from the vehicle.

INSTALLATION

1. Position the column in the vehicle making sure that the steering shaft engages the flex coupling.
2. Install the four steering column tube-to-dash panel attaching screws but do not tighten them.
3. Install the upper clamp and the two attaching nuts. Tighten the nuts finger tight.
4. Move the lower flange as required to center the steering shaft in the tube. Tighten the lower flange attaching nuts when the shaft is centered.
5. Install and tighten the flex coupling attaching bolt.
6. Tighten the instrument panel-to-clamp attaching nuts.
7. Connect the turn signal and solenoid wires at the multiple connectors.
8. Connect the vacuum hose to the vacuum motor and the safety switch wires to the switch (tilt-away column only).
9. Connect the negative cable to the battery.
10. Start the engine and check the operation of the steering column and switches (tilt-away column only).

4 MAJOR REPAIR OPERATIONS

STEERING GEAR

DISASSEMBLY

1. Rotate the steering shaft approximately 2 1/4 turns from either stop.
2. After removing the sector adjusting screw locknut and the housing cover bolts, remove the sector shaft with the cover. Remove the cover from the shaft by turning the screw clockwise. **Keep the shim with the screw** (Fig. 16).
3. Loosen the worm bearing adjuster nut, and remove the adjuster assembly and the steering shaft upper bearing and cup.
4. Carefully pull the steering shaft and ball nut from the housing. **To avoid possible damage to the ball return guides, keep the ball nut from running down to either end of the worm.**

Disassemble the ball nut only if there is indication of binding or tightness.

5. Remove the lower bearing and cup from the housing. It may be necessary to tap the housing on a block of wood (Fig. 17) to loosen it from the housing.
6. Remove the ball return guide clamp and the ball return guides from the ball nut. **Keep the ball nut clamp-side up until ready to remove the balls.**
7. Turn the ball nut over, and rotate the worm shaft from side to side until all balls (Mustang, Cougar—62 balls; Comet, Falcon, and Fairlane—54 balls) have dropped out of the nut into a clean pan. With the balls removed, the ball nut will slide off the worm.

Press both sector shaft bearings out of the housing (Fig. 18). **Remove the seal and the bearings only if there is an indication of wear, damage, or bearing mislocation. Do not install a new bearing in a housing in which the bearing has turned or is found to be mislocated. A new housing must be used.**

ASSEMBLY

1. If the sector shaft bearings have been removed, press new bearings into the housing (Fig. 19).
2. Position a bearing cup in the adjuster.
3. If the sector shaft oil seal has been removed, install a new oil seal.
4. Swab the inside diameter of the ball nut and the outside diameter of the worm with gear lubricant C3AZ-19578-A prior to assembly. Lay the steering shaft on a bench as shown in Fig. 20. After positioning the shaft, turn the ball nut to place the guide holes in the up position. Align

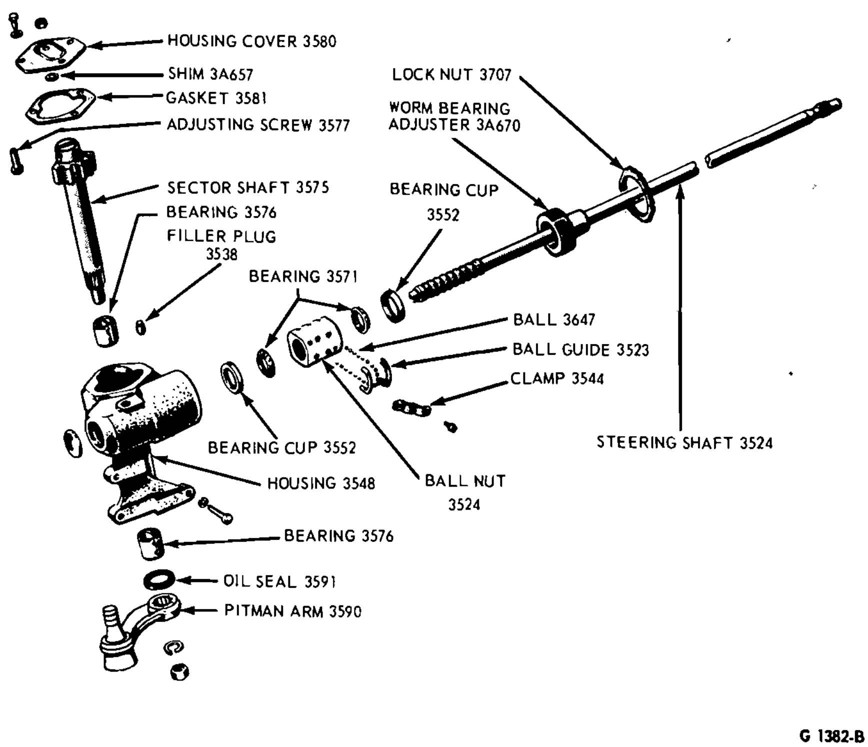


FIG. 16—**Manual Steering Gear Disassembled**

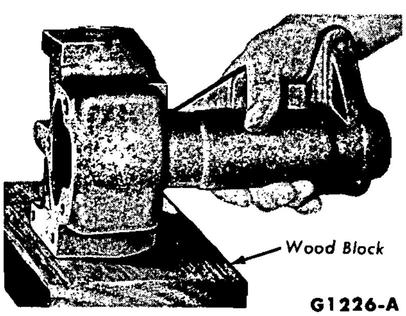


FIG. 17—**Removing Lower Bearing Cup from Housing**

the grooves 'in the worm and in the ball nut by sighting through the ball guide holes.

5. Insert the ball guides into the holes of the ball nut, tapping them lightly with a wood handle of a screw driver if necessary to seat them.

6. Insert the balls (Mustang and Cougar—62 balls; Comet, Falcon, and Fairlane—54 balls) into the hole in the top of each ball guide. It may be necessary to rotate the shaft slightly one way, then in the opposite direction to distribute the balls in the circuit.

7. After the balls (Mustang and Cougar—31 balls; Comet, Falcon, and Fairlane—27 balls) are installed, install the ball guide clamp. Check the ball nut to see that it rotates freely. Torque the screw to specification.

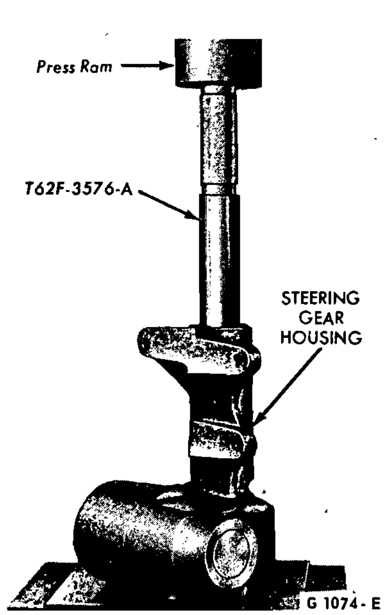


FIG. 18—**Removing Sector Shaft Bearing**

8. Coat the threads of the steering shaft bearing adjuster, the housing cover bolts, and the sector adjusting screw with a suitable oil-resistant sealing compound. **Do not apply sealer to female threads, and especially avoid getting any sealer on the steering shaft bearings.**

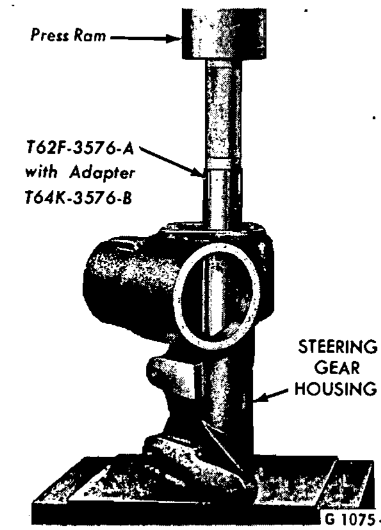


FIG. 19—**Installing Sector Shaft Bearing**

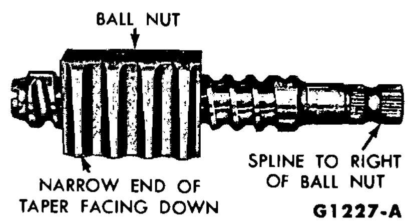


FIG. 20—**Positioning Ball Nut—Typical**

9. Coat the worm bearings, sector shaft bearing and gear teeth with gear lubricant C3AZ-19578-A.

10. Clamp the housing in a vise, with the sector shaft axis horizontal, and position the steering shaft lower bearing cup and the bearing in place.

11. Position the steering shaft and ball nut assembly in the housing.

12. Position the steering shaft upper bearing on the top of the worm, and install the steering shaft bearing adjuster and cup. Install the lock nut with the flat side against the bearing adjuster and the letter outward. Leave the nut loose.

13. After installing the steering wheel nut on the steering shaft adjust the worm bearing preload, using an inch-pound torque wrench to check for specified preload.

14. Position the sector adjusting screw and the adjuster shim, and check the end clearance which should not exceed 0.002 inch between the screw head and the end of the sector shaft. If clearance is greater than 0.002 inch, replace the shim with one of proper thickness.

15. Thread the sector shaft adjusting screw into the housing cover.

16. Install a new gasket on the housing cover.

17. Rotate the steering shaft until the ball nut teeth are in position to mesh with the sector gear, tilting the housing so that the ball nut will tip toward the housing cover opening.

18. Apply enough gear lubricant C3AZ-19578-A to fill the pocket in the housing between the sector shaft bearings 30% full.

19. Push the housing cover with the sector shaft into place.

20. Turn the cover to one side and fill the housing with 1/2 lb. of gear lubricant C3AZ-19578-A.

21. Install but do not tighten the housing cover attaching bolts. Do not tighten the cover bolts until it is certain that there is some lash between the ball nut and the sector gear teeth.

22. After loosely installing the sector shaft adjusting screw lock nut, adjust the sector shaft mesh to the specified mesh load, then tighten the adjusting screw lock nut. Remove the steering wheel nut.

5 STEERING LINKAGE REPAIR

The manual steering linkage (Figs. 21 and 22) consists of the Pitman arm, the steering arm-to-idler arm rod, the steering idler arm, and the spindle connecting rods (tie rods). **Do not attempt to straighten bent linkage; use new parts.**

HOISTING INSTRUCTIONS

Damage to suspension and/or steering linkage components may occur if care is not exercised when positioning the hoist adapters of 2 post hoists prior to lifting the vehicle.

If a 2 post hoist is used to lift the vehicle, place the adapters under the front suspension lower arms. **Do not allow the adapters to contact the steering linkage.**

SPINDLE CONNECTING ROD END REPLACEMENT

The spindle connecting rod ends, which are threaded into the outer ends of the rod sleeves, have non-adjustable, spring-loaded ball studs. A rod end should be replaced when excessive looseness at the ball stud is noticed.

1. Remove the cotter pin and nut from the worn rod end ball stud.

2. Disconnect the end from the spindle, connecting arm, Pitman arm, or idler arm as shown in Fig. 23.

3. Loosen the connecting rod sleeve clamp bolts, and count the number of turns needed to remove the rod end from the sleeve. Discard all rod end parts that were removed from the sleeve. **All new parts should be used when a spindle connecting rod end is replaced.**

4. Thread a new rod end into the sleeve, but do not tighten the sleeve clamp bolts at this time.

5. Insert the stud in the part from which the old one was removed, and install the stud nut. Torque the nut to specification and install the cotter pin.

6. Check and, if necessary, adjust toe-in (Part 3-1). **After toe-in is checked and adjusted, oil the sleeve clamp bolts and torque them to specification. Add four pounds torque if new bolts are used.** The tie rod sleeve clamps must be installed as shown in Fig. 21, Part 3-1, to prevent interference with the side rail.

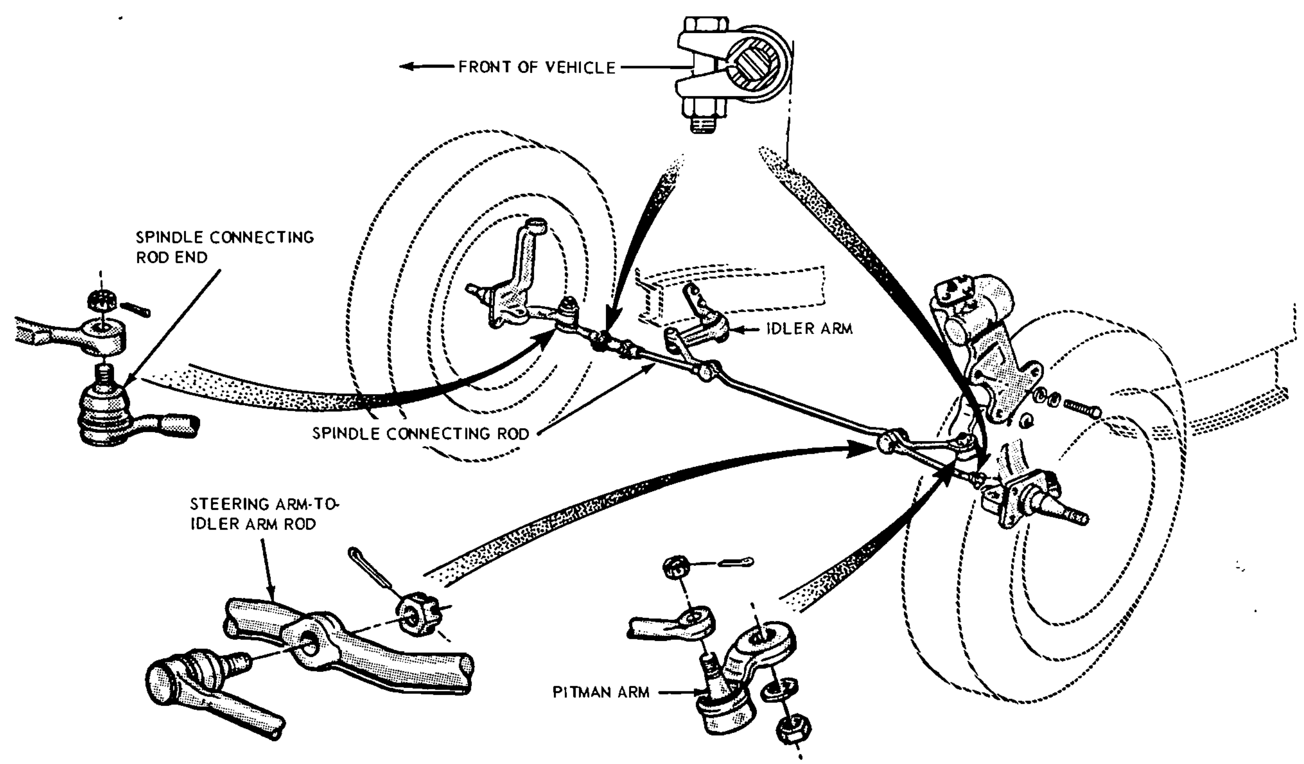


FIG. 21—Typical Manual Steering Linkage—All Vehicles

SPINDLE SLEEVE REPLACEMENT

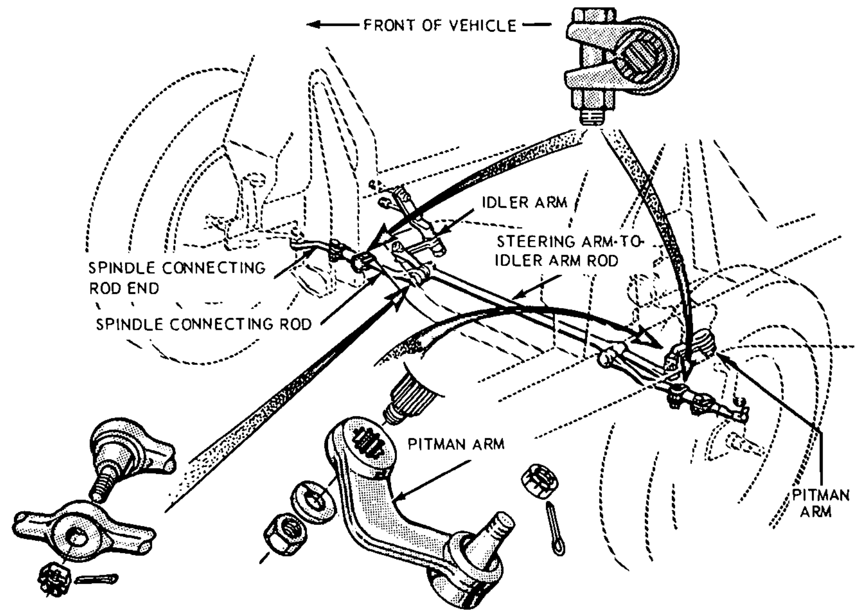
A spindle sleeve should be replaced if it becomes worn or damaged (Figs. 21 and 22). **Do not attempt to straighten the sleeve if threaded portion is damaged.**

1. Remove the spindle connecting rod ends as described in the previous sub-section.

2. Screw the spindle rod ends into the new sleeve the same number of turns as the ends that were removed. Do not tighten the clamp bolts at this time.

3. Position the sleeve assembly on the Pitman arm (or the idler arm) and the spindle arm. Install the attaching nut, torque it to specification, and install the cotter pin.

4. Check and, if necessary, adjust toe-in (Part 3-1). After toe-in is checked and adjusted, oil the sleeve clamp bolts then torque them to specification. The sleeve clamp must be installed as shown in Figs. 21 and 22.



POWER STEERING ONLY:
POSITION TWO ADJUSTING SLEEVE CLAMPS ON LEFT SIDE OF CAR.
FORWARD AS SHOWN, NO PORTION OF CLAMP ASSY. PERMITTED
REARWARD OF VERTICAL LINE TANGENT TO O.D. OF CLAMP.

G 1381-B

FIG. 22—Typical Manual Steering Linkage—Power Typical—Mustang

REPLACEMENT CENTER LINK —ALL VEHICLES

The center link connecting the Pitman arm and the idler arm is non-adjustable and is provided with tapered holes to accommodate the ball studs (Figs. 21 and 22). The link should be replaced when damaged or when worn at the ball studs.

REMOVAL

1. Raise the vehicle on a hoist and position safety stands.

2. Remove the two cotter pins and nuts retaining both spindle connecting rod ends to the steering arm-to-idler arm rod (Fig. 21).

3. Disconnect the spindle connecting rod ends from the steering arm-to-idler arm rod with Tool 3290-C (Fig. 23).

4. Remove one cotter pin and nut attaching the idler arm to the steering arm-to-idler arm rod and disconnect the idler arm from the rod with Tool 3290-C.

5. Remove one cotter pin and nut attaching the Pitman arm to the steering arm-to-idler arm rod. Disconnect the Pitman arm from the rod with Tool 3290-C and remove the rod.

INSTALLATION

1. Replace the rubber seals on the spindle connecting rod ends, if required.

2. Position the steering arm-to-idler arm rod to the Pitman arm and idler arm and install the attaching nuts. Torque the nuts to the low end of the specification. Continue to tighten each nut until the slots in the nut align with the hole in the stud. Then install the cotter pin.

3. Position the spindle connecting rod ends to the steering arm-to-idler arm rod and install the attaching nuts. Torque the nuts to the low end of the specification. Continue to tighten each nut until the slots in the nut align with the hole in the stud. Then, install the cotter pin.

4. Remove the safety stands, lower the vehicle, check and adjust toe-in to specification (Part 3-1).

STEERING IDLER ARM

1. Raise the vehicle and remove the cotter pin and nut attaching the idler arm to the center link (Figs. 21 and 22).

2. Remove the lock pin and nuts attaching the idler arm and bracket assembly to the side rail and remove the idler arm.

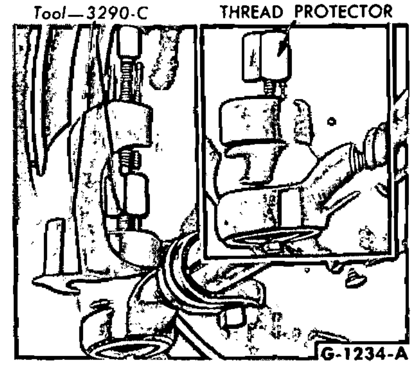


FIG. 23—Disconnecting Steering Linkage Ball Stud—Typical

3. Position the new idler arm to the side rail and install the attaching nuts.

4. Secure the center link to the idler arm with the castellated nut. Torque the nut to specification and install a new cotter pin.

5. Lower the vehicle and check caster, camber and toe-in and adjust if required.

PART 3-4—Power Steering

1 DESCRIPTION AND OPERATION

DESCRIPTION

The Power Steering System (Fig. 1) is a hydraulically controlled linkage-type steering system which includes an integral pump and fluid reservoir, a control valve, a power cylinder, the connecting fluid lines, and the steering linkage. The hydraulic pump, belt-driven from the engine crankshaft, draws fluid from the reservoir and provides fluid pressure for the system. Within the pump itself is a pressure-relief valve which governs the pressures within the steering system according to the varying conditions of operation. After fluid has passed from the pump to the control valve and the power cylinder, it returns to the reservoir.

The power steering pump is a belt driven slipper type pump which is integral with the reservoir. It is constructed so that the reservoir is attached to the rear side of the pump housing front plate and the pump body is incased within the reservoir.

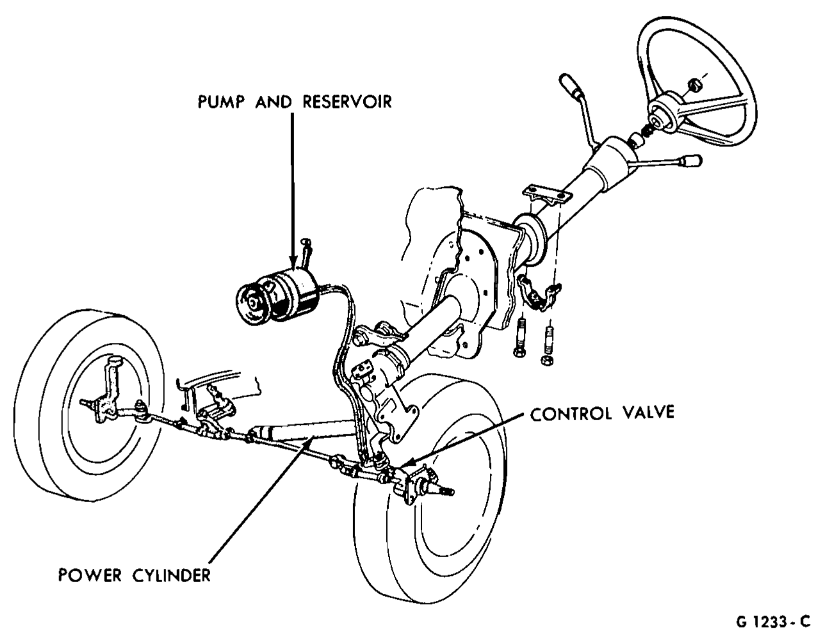


FIG. 1—Power Steering System

OPERATION

The control valve, operated by steering wheel movement, directs the pressure developed by the pump. When the front wheels are in the straight-ahead position, the control valve spool is held in the center (neutral) position by its centering spring. Fluid then flows around the valve lands and returns to the reservoir (Fig. 2). Within the control valve body there is a reaction limiting valve which reduces parking effort.

When force of about 4 pounds is exerted for a left turn, the valve spool overcomes the pressure of the centering spring and moves toward the right end of the valve. As a result, pressure is exerted on the right side of the power cylinder piston, and fluid in the left end of the cylinder returns to the reservoir (Fig. 2).

If the direction of the force on the steering wheel is reversed, the front wheels will turn to the straight forward position. Or as force on the steering wheel falls below approximately 4 pounds the valve spool centering spring forces the spool back to the center position and there the pressure on both sides of the power cylinder piston is equal. With normal forward driving movement of the vehicle and in the absence of operative pressure within the power cylinder, the

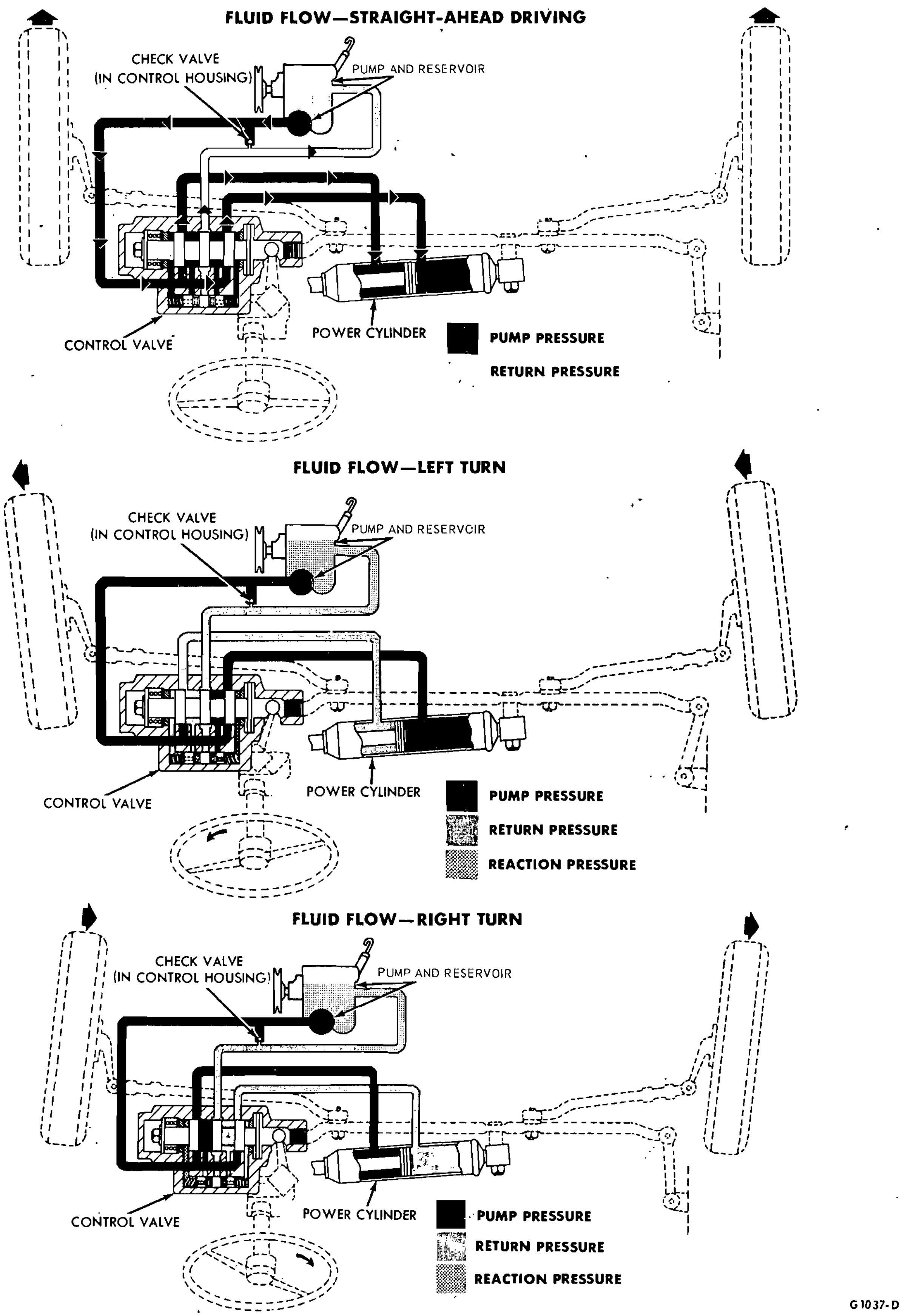


FIG. 2—Fluid Flow Diagram

front wheels will seek to return to the straight ahead position. This is a normal effect of the front wheel alignment.

For a right turn, the directional forces explained above are reversed (Fig. 2).

If, for any reason, the pump fails to deliver fluid pressure, the vehicle may be steered without pump pressure.

POWER STEERING PUMP

The pump rotor has 8 slippers and springs which rotate inside a cam insert containing two lobes 180° from each other. The cam insert and the pump port plates provide a sealed chamber within which the rotor and slippers rotate between the two lobes for pump operation.

As the rotor turns, the slippers are forced outward against the inner surface of the cam insert by a combination of centrifugal force, slipper spring force and fluid pressure acting on the under side of the slipper. A pair of adjacent slippers, along with the surfaces of the rotor, cam and pressure plates, form a sealed chamber within the crescent-shaped void. As this sealed chamber moves through the crescent shaped void its volume changes, resulting in a pumping action.

As the rotor rotates 90° (Fig. 3), the slipper slides outward in its slot, riding on the cam and the volume of the sealed chamber increases. This creates a vacuum and sets up a suction area. With the inlet port placed in this area, the chamber will fill with fluid. As the rotor rotates from 90° to 180°, the volume of the sealed chamber decreases, thus creating a pressure area. The pressure or outlet port is located in this area. While this pumping action is going on between 0° and 180°, the same condition is occurring between 180° and 360°. This combination creates what is known as a balanced rotor pump. The two pressure and suction quadrants are diametrically opposite each other.

FLOW CONTROL VALVE

Since the pump is a constant displacement pump, the internal flow will vary directly with the pump speed. However, a power steering gear requires a relatively high constant rate of flow in the parking zone and up to approximately 2800 rpm and thereafter a lower rate of flow. This is accomplished by means of a variable orifice mechanism shown in Fig. 4.

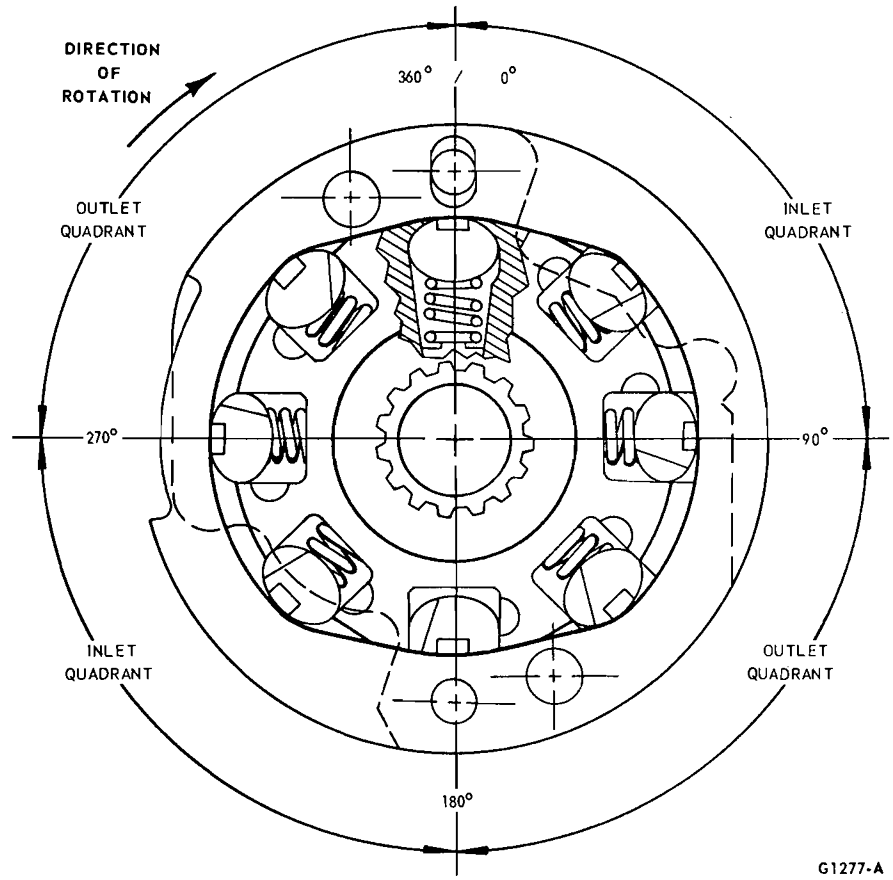


FIG. 3—Power Steering Pump Cycle

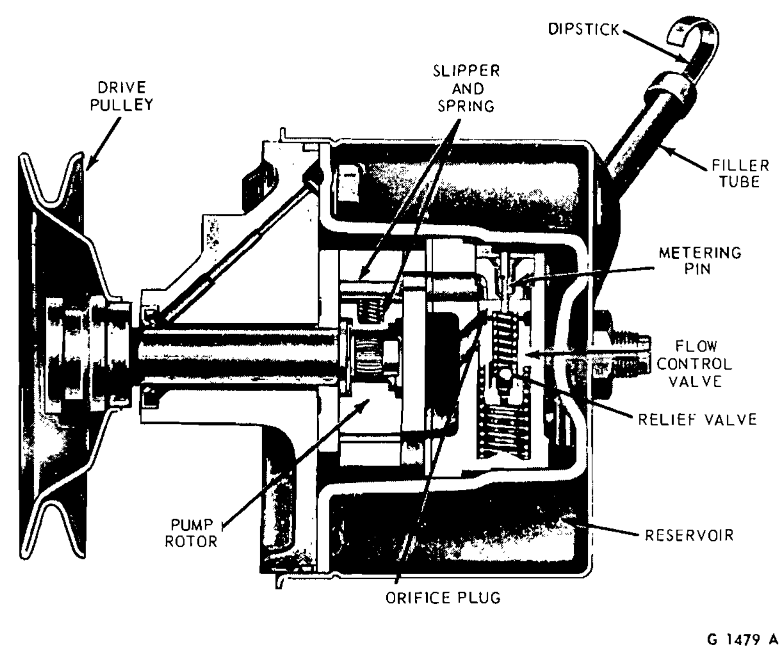


FIG. 4—Power Steering Pump—Sectional View

All of the internal pump flow is ported from the pumping mechanism (rotor, slippers, and cam insert), through passage A into the flow control zone. All of flow goes through the orifice and out into the line until the bypass port is cracked open. This is the regulation point. The fluid drops in pressure in moving through the orifice. The lower pressure is then sensed through a hole drilled in the cover communicating to the rear of the spool valve. The differential in pressure thus created on the spool valve increases steadily and proportionally with increasing rpm and this moves the valve progressively back into its bore, thus increasing the opening of the bypass port.

The metering pin (Fig. 4) travels with the spool valve decreasing the net area of the orifice at higher speeds. This action reduces flow to the steering gear.

PRESSURE RELIEF VALVE

When the steering wheel is turned completely to the stop position in the right or left turn direction, or in the case of a road load of sufficient magnitude, the steering cylinder will not accept any flow from the pump, except for a very limited volume of fluid due to leakage past valve seals. Because of this resistance, excessive hydraulic pressure would be developed, if it were not limited by the pressure relief valve.

When relief pressure is reached, the pressure relief ball is forced off its seat, allowing fluid to pass through the spool valve and dump into the bypass port (Fig. 4). The relief valve will continue to limit fluid pressure to the relief setting for the duration of the overload condition.

2 IN-VEHICLE ADJUSTMENTS AND REPAIRS

HOISTING INSTRUCTIONS

Damage to suspension and/or steering linkage components may occur if care is not exercised when positioning the hoist adapters of 2 post hoists prior to lifting the vehicle.

If a 2 post hoist is used to lift the vehicle, place the adapters under the front suspension lower arms. **Do not allow the adapters to contact the steering linkage.**

POWER STEERING PUMP BELT TENSION ADJUSTMENT

Pump drive belt tension cannot be checked accurately using the thumb pressure or belt deflection methods. Correct belt adjustment is assured only with the use of a belt tension gauge.

1. Check the belt tension with a belt tension gauge (T63L-8620-A). With a new belt, or one that has been run for less than 15 minutes, the tension should be within 120-150 lbs. With a belt that has been run for more than 15 minutes, the tension should be within 90-120 lbs.
2. To adjust the belt, loosen the mounting bolts incorporated on the front face of the pump cover plate (hub side) and one nut at the rear. Place a 9/16 inch open end wrench on the projecting 1/2 inch boss on the front face of the pump cover plate and pry upward to adjust belt tension on 6 cylinder engine. On 8 cylinder engines, use leverage between mounting bracket and hub of pulley. **When adjusting the power steering pump belt tension, do not pry against the pump or reservoir to obtain the proper belt tension. The reservoir will be deformed when pried on or pressed against and a leak will result.**
3. Recheck the belt tension. When the tension has been correctly adjusted, torque the bolts and the nut to specification.

CONTROL VALVE CENTERING SPRING ADJUSTMENT

1. Raise the vehicle and remove 2 spring cap attaching screws and lock washers and remove the spring cap.
2. Tighten the adjusting nut snug; then, loosen the nut 1/4 turn. Do not tighten the adjusting nut too tight.
3. Position the spring cap to the valve housing and install the 2 attaching screws and washers.
4. Lower the vehicle.
5. Start the engine and check the turning effort with a spring scale. With the spring scale attached to the rim of the steering wheel, the effort to turn the wheel in both directions should not exceed 12 pounds.

CONTROL VALVE TO POWER STEERING CYLINDER HOSE

1. Raise the vehicle on a hoist and place a drain pan under the power cylinder.
2. Disconnect the hose from the power cylinder and allow the fluid to drain from the hose. Then, disconnect the hose from the control valve.
3. Connect the hose to the control valve and power cylinder.
4. Remove the drain pan and lower the vehicle.
5. Fill the power steering pump reservoir with fluid to the proper level (Part 3-1).
6. Start the engine and turn the steering wheel to each end of its travel several times to cycle the system. Then, check for leaks.
7. Stop the engine and again check the power steering fluid level. Add fluid as required.

POWER STEERING PUMP TO CONTROL VALVE HOSE

REMOVAL

1. Remove the fluid from the pump reservoir with a suction gun.
2. Raise the vehicle on a hoist.
3. Remove the clamp retaining the hose tubes to the control valve.
4. Disconnect the fluid return and pressure hoses from the control valve and allow the fluid to drain into a pan.
5. Lower the vehicle and disconnect the fluid return hose from the reservoir.
6. Disconnect the fluid pressure hose from the pump outlet fitting.
7. Remove 1 bolt attaching the hoses, insulator, and the retainer to the frame side rail and remove the hoses, and the insulator and retainer as an assembly from the vehicle.
8. Remove the pressure and return hoses from the retainer and insulator.

INSTALLATION

1. Install the pressure and return hoses in the insulator and retainer. Position the assembly to the frame side rail and install the attaching bolt.
2. Place a hose clamp on the fluid return hose and install the hose on the power steering pump reservoir return fitting.
3. Torque the pump outlet fitting to specification (Part 3-6). Then, connect the pressure hose to the outlet fitting and torque the fitting to specification.
4. Raise the vehicle and connect

the pressure and return lines to the control valve.

5. Install the clamp to retain the hose tubes to the control valve.

6. Lower the vehicle and fill the power steering pump reservoir with fluid, C1AZ-19582-A, to the proper level (Part 3-1).

7. Start the engine and turn the steering wheel to each end of its travel several times to cycle the system. Then, check for fluid leaks.

8. Stop the engine and again check the power steering fluid level (Part 3-1). Add fluid as required.

3 REMOVAL AND INSTALLATION

HOISTING INSTRUCTIONS

Damage to suspension and/or steering linkage components may occur if care is not exercised when positioning the hoist adapters of 2 post hoists prior to lifting the vehicle.

If a 2 post hoist is used to lift the vehicle, place the adapters under the front suspension lower arms. **Do not allow the adapters to contact the steering linkage.**

STEERING GEAR

Refer to Group 3-3, Section 3 for detailed instructions.

POWER STEERING PUMP

6-CYLINDER

Removal

1. Remove the fill cap from the reservoir and remove the fluid with a suction gun.

2. Disconnect the fluid return hose from the reservoir.

3. Disconnect the fluid pressure hose from the pump.

4. Loosen the adjusting bolts and remove the drive belt from the pulley.

5. Drain the coolant from the radiator and remove bolts attaching the pump bracket to the engine. Remove one bolt attaching the support to the lower edge of the bracket and remove the pump and bracket from the vehicle.

6. Place the bracket in a vise and install a 3/8-16 capscrew in the end of the pump shaft.

7. Install tool T63L-10300-B on the pulley and remove the pulley from the pump shaft. Refer to Fig. 5 for tool installation.

8. Remove 3 bolts attaching the pump to the bracket and remove the pump from the bracket.

Installation

1. Position the pump to the bracket and install but do not tighten bolts. Torque to specification.

2. Position the pulley to the pump shaft and install tool T65P-3A733A. Press the pulley on the shaft. (Refer to Fig. 4 for tool installation.) Then, remove the tool.

3. Position the pump and bracket to the engine and install the attaching bolts.

4. Install one bolt to attach the brace to the bottom of the bracket. Torque the bracket attaching bolts to specification (Part 3-6).

5. Position the belt on the pulley and adjust the belt tension to specification with Tool T63L-8620-A (Section 2).

6. Torque the outlet fitting hex nut to specification. Then, connect the pressure hose to the fitting and torque the hose nut to specification.

7. Connect the return hose to the reservoir and tighten the clamp.

8. Fill the radiator with coolant.

9. Fill the pump reservoir to the correct level with transmission fluid (C1AZ-19582-A). Start the engine and turn the steering wheel to each end of its travel several times to cycle the system and check for leaks. Check the fluid level (Section 1, Part 3-1) and fill as required and install the fill cap.

8-CYLINDER

Removal

1. Remove the fill cap from the reservoir and remove the fluid with a suction gun.

2. Disconnect the fluid return hose from the reservoir.

3. Disconnect the fluid pressure hose from the pump.

4. Remove the belt adjusting bolt and nut. Remove the drive belt from the pump pulley.

5. Remove 3 bolts attaching the pump to the bracket and remove the pump from the vehicle.

Installation

1. Position the pump to the bracket and loosely install the 3 pump to bracket attaching bolts and the adjusting bolt.

2. Position the drive belt on the pulley and adjust the belt tension to specification with tool T63L-8620-A (Section 2). Tighten the adjusting bolt and nut to specification.

3. Torque the outlet fitting hex nut to specification (Part 3-6). Then, connect the pressure hose to the fitting and torque the hose nut to specification.

4. Connect the return hose to the reservoir and tighten the clamp.

5. Fill the pump reservoir to the correct level with transmission fluid C1AZ-19582-A. Start the engine and turn the steering wheel to each end of its travel several times to cycle the system and check for leaks. Check the fluid level, fill as required, and install the fill cap.

POWER STEERING PUMP PULLEY

REMOVAL

Other than pulley removal and reservoir or seal replacement, the pump should not be disassembled but replaced as a unit.

1. Drain as much of the fluid as possible from the pump through the fill pipe.

2. Install a 3/8-16 capscrew in the end of the pump shaft to prevent damage to the shaft end by the tool screw.

3. Install the pulley remover tool, T63L-10300-B on the pulley hub, and place the tool and pump in a vise as shown in Fig. 5.

4. Hold the pump and rotate the tool nut counterclockwise to remove the pulley (Fig. 5).

INSTALLATION

1. Position the pulley to the pump shaft and install Tool T65P-3A733-A as shown in Fig. 6.

2. Hold the pump and rotate the tool nut clockwise to install the pulley on the shaft. The pulley face will be flush with the end of the pump shaft. **Install the pulley without in and out pressure on the shaft to prevent damage to internal thrust areas.**

3. Remove the tool.

POWER STEERING CONTROL VALVE—ALL MODELS

REMOVAL

1. Disconnect the 4 fluid line fittings at the control valve, and drain the fluid from the lines. Turn the front wheels to the left and right several times to force all the fluid from the system.
2. Loosen the clamping nut and bolt at the right end of the sleeve.
3. Remove the roll pin from the steering arm to idler arm rod through the slot in the sleeve.
4. Remove the control valve ball stud nut.
5. Using the tool shown in Fig. 7, remove the ball stud from the sector shaft arm.
6. After turning the front wheels fully to the left, unthread the control valve from the center link steering arm to idler arm rod.

INSTALLATION

1. Thread the valve onto the center link until about four threads are still visible on the link.
2. Position the ball stud in the sector shaft arm.
3. Measure the distance between the center of the grease plug in the sleeve and the center of the stud at the inner end of the left spindle connecting rod (Fig. 8). The distance should be 5 5/8 inches for Comet, Falcon and Fairlane vehicles. The distance should be 5 inches for Mustang and Cougar models. If the distance is not correct, disconnect the ball stud from the sector shaft arm and turn the valve on the center link to increase or decrease the distance.

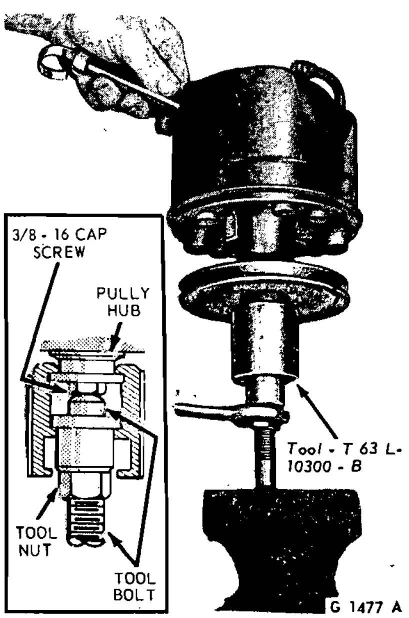


FIG. 5—Removing Pulley From Pump

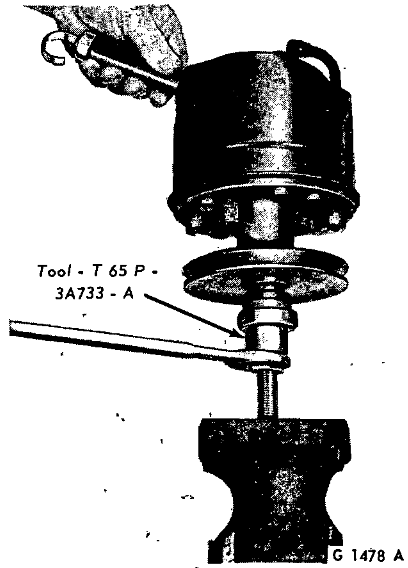


FIG. 6—Pulley Installation

4. When the correct distance is obtained and the ball stud is positioned in the sector shaft arm, align the hole in the steering arm to idler arm rod with the slot near the end of the valve sleeve. Install the roll pin in the rod hole to lock the valve in position on the rod.
5. Torque the valve sleeve clamp bolt to specification.
6. Install the nut on the ball stud, and torque the nut to specification. Install a new cotter pin.
7. Connect the fluid lines to the control valve, and tighten all fittings securely. **Do not over-tighten.**

8. Fill the fluid reservoir with the specified fluid to the F mark on the dip stick.

9. Start the engine and run it at idle speed for about two minutes to warm the fluid in the power steering system.

10. Turn the steering wheel all the way to the left and right several times, and check the system for fluid leaks.

11. Increase the engine speed to about 1000 rpm, and turn the steering wheel all the way to the left and right several times.

12. Stop the engine, and check the control valve and hose connections for fluid leaks. Correct the cause of any leaks.

13. Check the fluid level, and refill the reservoir if necessary.

14. With the engine running check the position of the steering wheel when the front wheels are in the straight-ahead position. **Do not make any adjustments until toe-in is checked.**

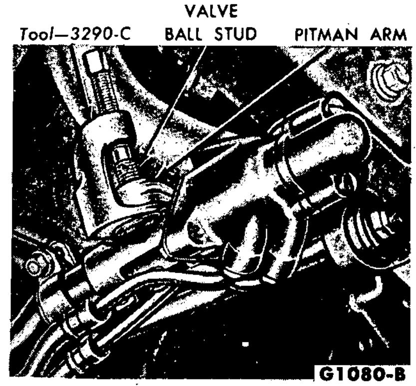


FIG. 7—Control Valve Ball Stud Removal

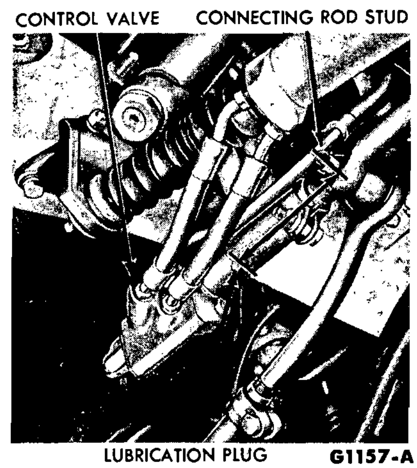


FIG. 8—Control Valve Installation Measurements—All Models

15. Keep the engine running, and check toe-in. If either toe-in or steering wheel position is not correct make all necessary adjustments (Part 3-1) at the spindle connecting rod sleeves.
16. Check the effort to turn the wheels in both directions. The effort should be about equal in both directions.

POWER CYLINDER

REMOVAL

1. Disconnect the two fluid lines from the power cylinder and allow them to drain into a container.
2. Remove the pal nut, attaching nut, washer and the insulator from the end of the power cylinder rod.
3. Remove the cotter pin and castellated nut that secures the power cylinder stud to the steering arm-to-idle arm rod.
4. Disconnect the power cylinder stud from the steering arm-to-idler arm rod as shown in Fig. 9.

5. Remove the insulator sleeve and washer from the end of the power cylinder rod.

6. Inspect the tube fittings and the seats in the power cylinder for nicks, burrs or damage. Replace the seats in the cylinder or the tubes as required.

INSTALLATION

1. Install the washer, sleeve and the insulator on the end of the power cylinder rod.

2. Extend the rod as far as possible. Insert the rod in the bracket on the frame and compress the rod as necessary to insert the stud in the steering arm-to-idler arm rod. Secure the stud with a castellated nut and a cotter pin.

3. Secure the power cylinder rod with an insulator, washer, nut and a pal nut.

4. Connect each of the two fluid lines to their respective port in the cylinder.

5. Fill the reservoir to the correct level.

6. Start the engine and turn the steering wheel to each end of its travel several times to cycle the system. Stop the engine.

7. Check the fluid level and fill as necessary. Install the dipstick and cap.

8. Start the engine and check for leaks.

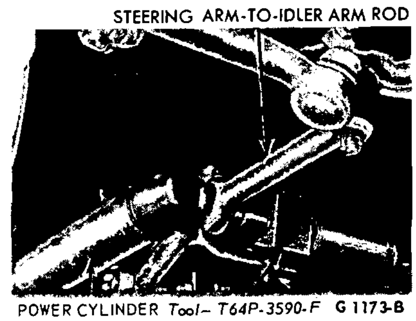


FIG. 9—Disconnecting Power Cylinder Stud

4 MAJOR REPAIR OPERATIONS

CONTROL VALVE

DISASSEMBLY

1. Wipe all fluid and loose dirt from the outside of the control valve.

2. Remove the centering spring cap from the valve housing (Fig. 10).

When holding the control valve for disassembly, use a softjawed vise, and clamp the valve only around the sleeve flange to prevent damage to the housing, spool, or sleeve.

3. Remove the nut from the end of the valve spool bolt. Remove the washers, spacer, centering spring, adapter, and bushing from the bolt and the valve housing.

4. Remove the two bolts that hold the valve housing and the sleeve together, and separate the housing from the sleeve.

5. Remove the plug from the valve sleeve.

6. Push the valve spool out of the centering spring end of the valve housing, and remove the seal from the spool.

7. Remove the spacer, bushing, and seal from the sleeve end of the valve housing.

8. Drive the stop pin out of the travel regulator stop with a punch and hammer (Fig. 11). **Pull the head of the valve spool bolt tightly against the travel regulator stop before driving the pin out of the stop.**

9. Turn the travel regulator stop counterclockwise in the valve sleeve to remove the stop from the sleeve.

10. Remove the valve spool bolt,

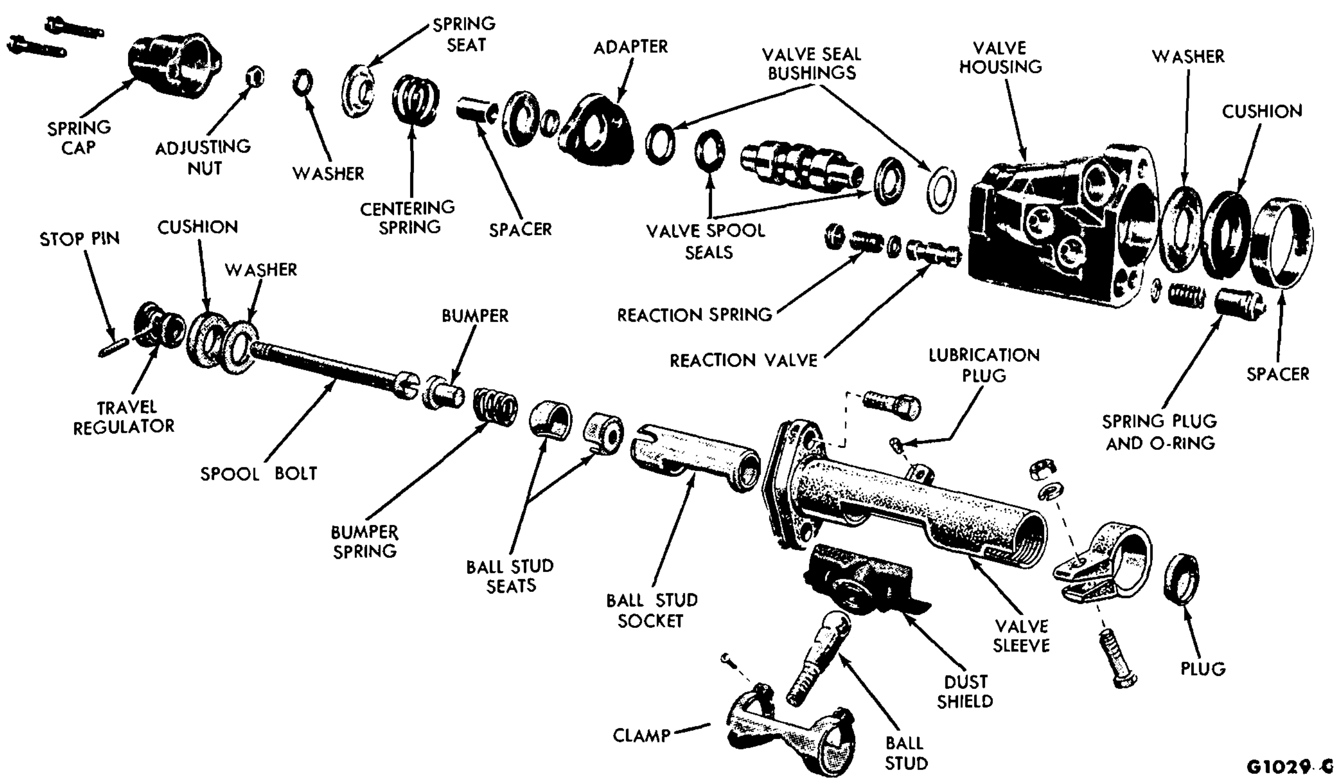


FIG. 10—Control Valve Disassembled—Typical

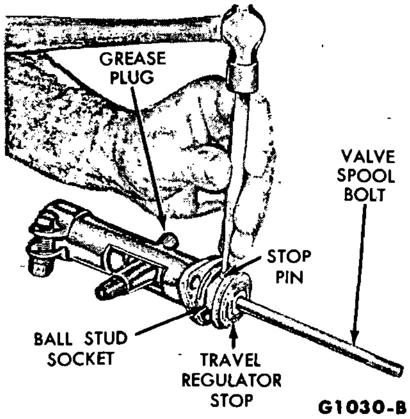


FIG. 11—Removing Stop Pin—

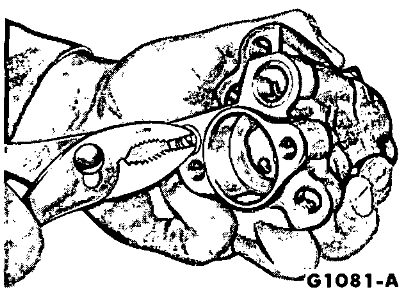


FIG. 12—Removing Reaction Valve Plug

spacer, and rubber washer from the travel regulator stop.

11. Remove the rubber boot and clamp from the valve sleeve.

12. Slide the bumper, spring, and ball stud seat out of the valve sleeve, and remove the ball stud socket from the sleeve.

13. After removing the return port hose seat, remove the return port relief valve.

14. After removing the spring plug and O-ring, remove the reaction limiting valve (Fig. 12)

TUBE SEAT REPLACEMENT

If a hose seat is worn or damaged it should be replaced. It can be removed with an Easy-Out tool, or by using a bolt of appropriate size as a puller.

1. Tap the existing hole in the hose seat, using a starting tap of suitable size. **Be sure to remove all metal chips from the hose seat port after tapping.**

2. Place a nut and large flat washer on a bolt of the same size as the tapped hole. The washer must be large enough to cover the hose seat port.

3. Insert the bolt in the tapped hole, and using the nut as a puller, remove the hose seat.

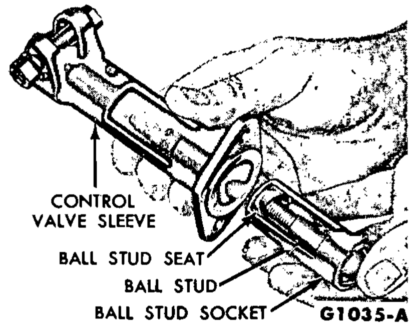


FIG. 13—Installing Ball Socket, Seal and Bracket

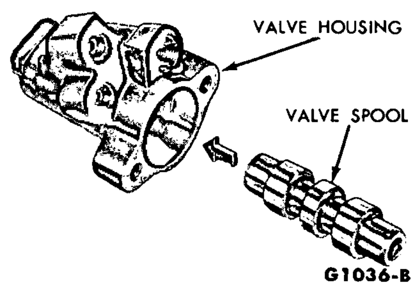


FIG. 14—Inserting Valve Spool

4. Place a new hose seat in the port, and thread a bolt of suitable size into the port. Tighten the bolt enough to bottom the seat in the port.

ASSEMBLY

Before assembling the control valve, coat all parts except the seals with Automatic Transmission Fluid. Coat the seals with lubricant COAZ-19553-A.

1. Install the reaction limiting valve, the spring, and the plug.

2. Install the return port relief valve and the hose seat.

3. Insert one of the ball stud seats (flat end first) into the ball stud socket, and insert the threaded end of the ball stud into the socket.

4. Place the socket in the control valve sleeve so that the threaded end of the ball stud can be pulled out through the slot in the sleeve (Fig. 13).

5. Place the other ball stud seat, the spring, and the bumper (Fig. 10) in the socket, and install and securely tighten the travel regulator stop.

6. Loosen the stop just enough to align the nearest hole in the stop with slot in the ball stud socket, and install the stop pin in the ball stud socket, travel regulator stop, and valve spool bolt (Fig. 11)

7. Install the rubber boot, clamp, and the plug on the control valve sleeve. **Make sure that the lubrication fitting is turned on tightly and does not bind on the ball stud socket.**

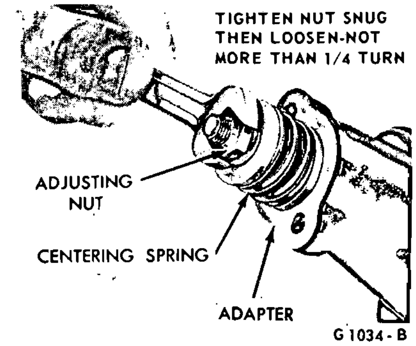


FIG. 15—Adjusting Centering Spring

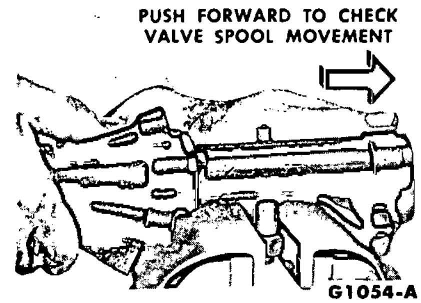


FIG. 16—Inspecting Valve Spool Movement

8. Insert the valve spool in the valve housing. **Rotate the spool while inserting it in the housing (Fig. 14).**

9. Move the spool toward the centering spring end of the housing, and place the small seal bushing, and spacer in the sleeve end of the housing.

10. Press the valve spool against the inner lip of the seal and, at the same time, guide the lip of the seal over the spool with a small screwdriver. **Do not nick or scratch the seal or the spool during installation.**

11. Place the sleeve end of the housing on a flat surface so that the seal, bushing, and spacer are at the bottom end and push down the valve spool until it stops.

12. Carefully install the spool seal and bushing in the centering spring end of the housing. Press the seal against the end of the spool, guiding the seal over the spool with a small screwdriver. **Do not nick or scratch the seal or the spool during installation.**

13. Pick up the housing, and slide the spool back and forth in the housing to check for free movement.

14. Place the valve sleeve on the housing so that the ball stud is on the same side of the housing as the ports for the two power cylinder lines. Install the two bolts in the sleeve, and torque them to specifications.

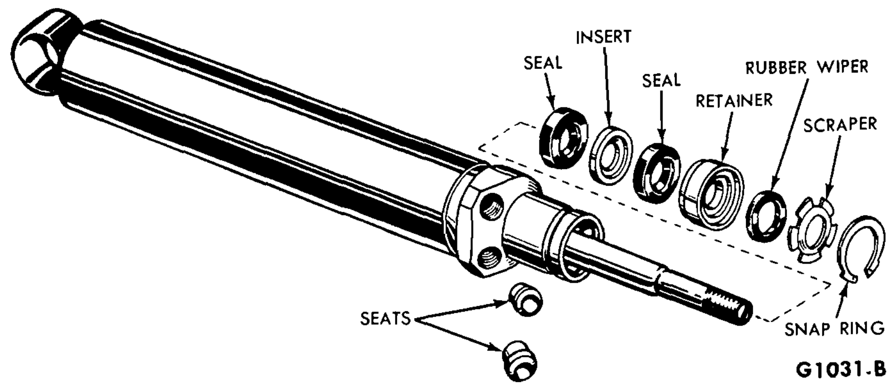


FIG. 17—Power Cylinder

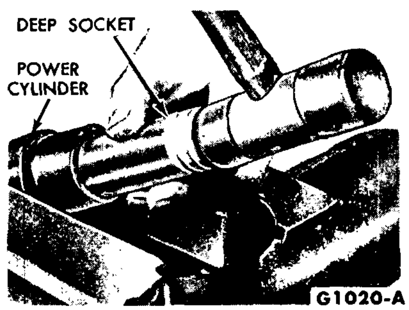


FIG. 18—Installing Power Cylinder Seals

15. Place the adapter on the centering spring end of the housing, and install the bushing, washers, spacers, and centering spring on the valve spool bolt.

16. Compress the centering spring, and install the nut on the bolt. Tighten the nut snug, then loosen it not more than 1/4 turn (Fig. 15). **Excessive tightening of the nut may break the stop pin at the travel regulator stop.**

17. Move the ball stud back and forth in the sleeve slot to check the spool for free movement. See Part 3-6 for the specified travel. Apply COAZ-19553-A (silicone) grease at the sealing areas.

18. Install the centering spring cap on the valve housing, and torque the two cap bolts to specification.

19. Install the nut on the ball stud so that the valve can be positioned in a vise as shown in Fig. 16. Then push forward on the cap end of the valve to check the valve spool for free movement.

20. Turn the valve around in the vise, and push forward on the sleeve end to check the spool for free movement.

POWER CYLINDER SEAL

REMOVAL

1. Clamp the power cylinder in a

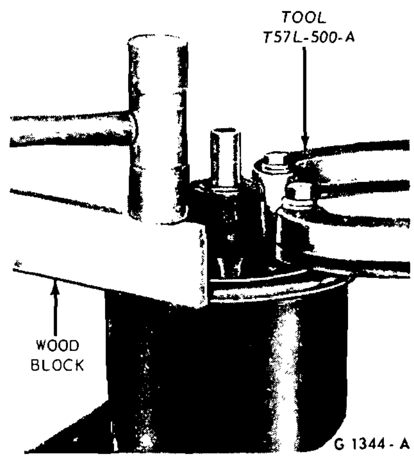


FIG. 19—Removing Pump Reservoir

vise, and remove the snap ring from the end of the cylinder. **Be careful not to distort or crack the cylinder in the vise.**

2. Pull the piston rod out all the way to remove the scraper, bushing, and seals. If the seals cannot be removed in this manner, remove them from the cylinder with a sharp pick. Take care, when using a pick, not to damage the shaft or seal seat.

INSTALLATION

When replacing the power cylinder seals, install all of the parts supplied in the repair kit for the cylinder being repaired.

1. Coat the new seals with lubricant COAZ-19553-A and place the parts (Fig. 17) on the piston rod which has been coated with the same grease.

2. Push the rod in all the way, and install the parts in the cylinder with a deep socket slightly smaller than the cylinder opening (Fig. 18).

POWER STEERING PUMP RESERVOIR REPLACEMENT

Reservoir replacement must be

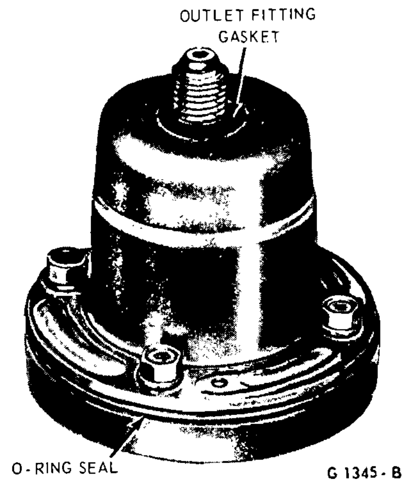


FIG. 20—Gasket Locations

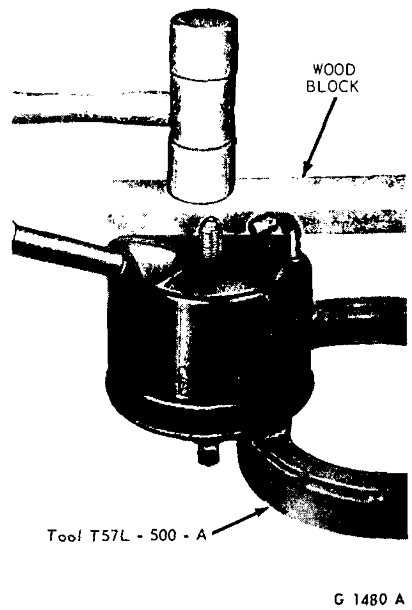


FIG. 21—Installing Reservoir on Pump

done on a clean workbench. Cleanliness of work area and tools is extremely important when repairing any hydraulic unit. Thoroughly clean the exterior of the pump with a suitable cleaning solvent. **Do not clean, wash or soak the shaft oil seal in solvent.** Plug the inlet and outlet openings with plugs or masking tape before cleaning the pump exterior or removing the reservoir.

REMOVAL

1. Position the pump in a bench mounted holding fixture, Tool T57L-500-A.

2. Rotate the pump so the pulley side is facing down and remove the

outlet fitting hex nut, and the service identification tag.

3. Invert the pump so the pulley side is facing up and remove the reservoir by tapping around the flange with a wood block (Fig. 19).

4. Remove the reservoir O-ring seal, the outlet fitting gasket, from the pump.

INSTALLATION

1. Install a new gasket on the outlet fitting and a new reservoir O-ring seal on the pump housing plate (Fig. 20). **The old gaskets and seal should never be re-used.**

2. Apply vaseline to the reservoir O-ring seal and to the inside edge of the new reservoir flange. **Do not twist the O-ring seal.**

3. Position the reservoir over the pump and align the notch in the reservoir flange with the notch in the outer diameter of the plate and bushing assembly.

4. Install the reservoir on the pump and O-ring seal with a plastic or rubber hammer and a block of wood as shown in Fig. 21. **Tap at the rear of the reservoir and on the outer edges only.**

5. Inspect the assembly to be sure the reservoir is evenly seated on the pump housing plate.

6. Position the service identification tag on the outlet fitting and install the outlet fitting hex nut. Torque the nut to specification (Part 3-6). **Do not exceed specification.**

PART 3-5—Wheels and Tires

1 DESCRIPTION AND OPERATION

FRONT WHEEL

Each front wheel and tire assembly is bolted to its respective front hub and brake drum (or rotor with disc brakes-optional). Two opposed tapered roller bearings are installed in each hub. A grease retainer is installed at the inner end of the hub to prevent lubricant from leaking into the drum or on the rotor. The entire assembly is retained to its spindle by the adjusting nut, nut lock and cotter pin (Figs. 1 and 2).

REAR WHEEL

The rear brake drum assembly is retained to studs on the rear axle shaft flange by three speed nuts. The wheel and tire assembly mounts on the same rear axle shaft flange studs and is held against the hub and drum by the wheel nuts. The rear wheel bearing is pressed onto the axle shaft just inside the shaft flange, and the entire assembly is retained to the rear axle housing by the bearing retainer plate which is bolted to the housing flange.

The inner end of each axle shaft is splined to the differential in the rear axle.

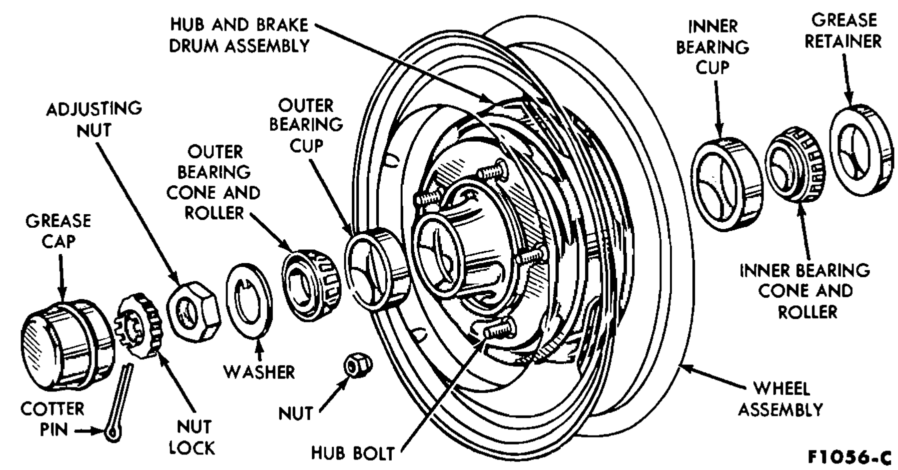


FIG. 1—Front Hub, Bearings and Grease Retainer—Drum Brakes

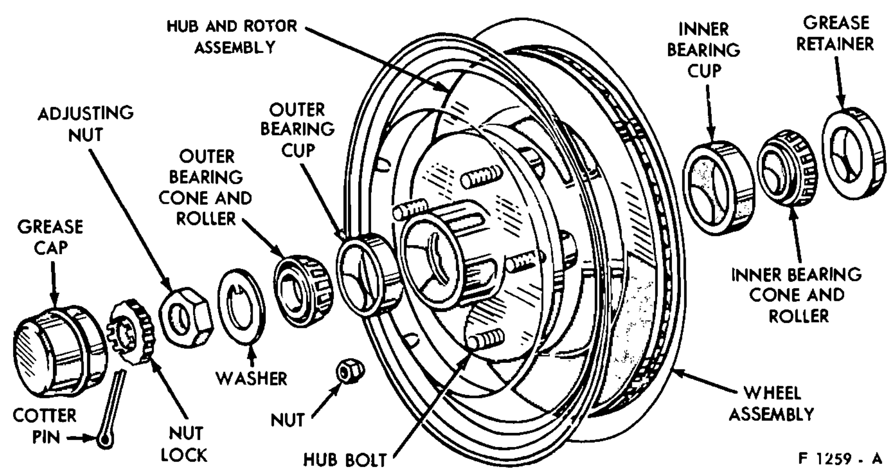


FIG. 2—Front Hub, Bearings and Grease Retainer—Disc Brakes

2 IN-VEHICLE ADJUSTMENTS AND REPAIRS

HOISTING INSTRUCTIONS

Damage to suspension and/or steering linkage components may occur if care is not exercised when positioning the hoist adapters of 2 post hoists prior to lifting the vehicle.

If a 2 post hoist is used to lift the vehicle, place the adapters under the front suspension lower arms. **Do not allow the adapters to contact the steering linkage.**

FRONT WHEEL BEARING ADJUSTMENT

The front wheel bearings should be adjusted if the wheel is too loose on the spindle or if the wheel does

not rotate freely. The following procedure will bring the bearing adjustment to specification.

1. Raise the vehicle until the wheel and tire clear the floor.

2. Pry off the hub cap or wheel cover and remove the grease cap from the hub.

3. Wipe the excess grease from the end of the spindle, and remove the cotter pin and nut lock.

4. If equipped with disc brakes, loosen the bearing adjusting nut three turns. Then, rock the wheel and rotor assembly in and out several times to push the shoe and linings away from the rotor.

5. While rotating the wheel, hub, and drum or rotor assembly, torque the adjusting nut to 17-25 ft-lbs to seat the bearings (Fig. 3).

6. Locate the nut lock on the adjusting nut so that the castellations on the lock are aligned with the cotter pin hole in the spindle.

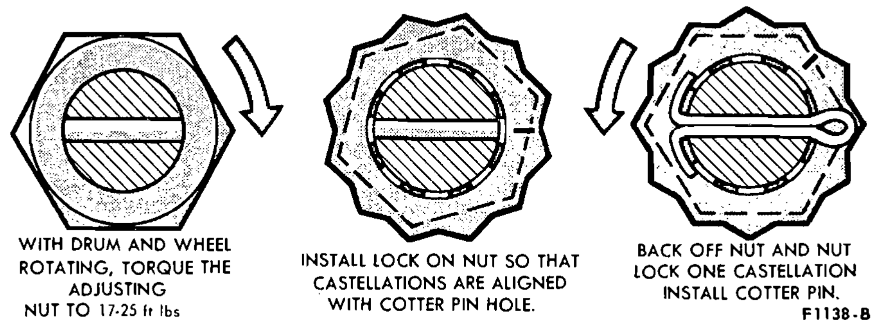


FIG. 3—**Front Wheel Bearing Adjustment**

7. Back off both the adjusting nut and the nut lock together until the next castellation on the nut lock aligns with the cotter pin hole in the spindle.

8. Install a new cotter pin, and bend the ends of the cotter pin around the castellated flange of the nut lock.

9. Check the front wheel rotation. If the wheel rotates properly, install the grease cap and the hub cap or wheel cover. If the wheel still rotates roughly or noisily, clean or replace the bearings and cups as required (Section 4).

10. Before driving the vehicle (if equipped with disc brakes), pump the brake pedal several times to obtain normal brake lining to rotor clearance and restore normal brake pedal travel.

3 REMOVAL AND INSTALLATION

HOISTING INSTRUCTIONS

Damage to suspension and/or steering linkage components may occur if care is not exercised when positioning the hoist adapters of 2 post hoists prior to lifting the vehicle.

If a 2 post hoist is used to lift the vehicle, place the adapters under the front suspension lower arms. **Do not allow the adapters to contact the steering linkage.**

WHEEL AND TIRE REMOVAL

1. Pry off the wheel hub cap or cover. Loosen but do not remove the wheel lug nuts.

2. Raise the vehicle until the wheel and tire clear the floor.

3. Remove the wheel lug nuts from the bolts, and pull the wheel and tire assembly from the hub and drum or rotor.

REMOVING TIRE FROM WHEEL

The tire can be demounted on a mounting machine. **Be sure that the outer side of the wheel is positioned downward.** If tire irons are used follow the procedure given here.

1. Remove the valve cap and core, and deflate the tire completely.

2. With a bead loosening tool, break loose the tire side walls from the wheel (Fig. 4).

3. Position the outer side of the wheel downward, and insert two tire irons about 8 inches apart between the tire inner bead and the back side of the wheel rim. **Use only tire irons with rounded edges or irons designed for demounting tubeless tires.**

4. Leave one tire iron in position, and pry the rest of the bead over the rim with the other iron. Take small "bites" with the iron around the tire in order to avoid damaging the sealing surface of the tire bead.

5. Stand the wheel and tire upright with the tire outer bead in the drop center well at the bottom of the wheel. Insert the tire iron between the bead and the edge of the wheel rim, and pry the wheel out of the tire.

INSTALLING TIRE ON WHEEL

1. If a used tire is being installed remove all dirt from the tire.

If a tire is being mounted to the original wheel, clean the rim with emery cloth or fine steel wool. Check the rim for dents.

If a new wheel is being installed, coat a new valve with RUGLYDE or similar rubber lubricant and position the valve to the new wheel. Use a rubber hammer or a valve replacing tool to seat the valve firmly against the inside of the rim.

2. Apply RUGLYDE or a similar rubber lubricant to the sealing surface on both tire beads. With the outer side of the wheel down, pry the beads over the wheel rim with two tire irons. **Do not use a hammer or mallet to force the beads over the rim.**

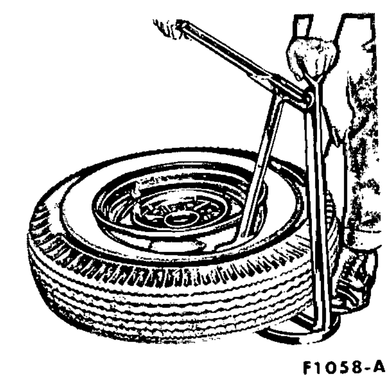


FIG. 4—**Bead Loosening Tool**

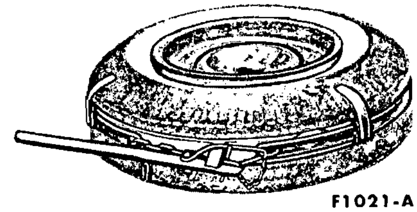


FIG. 5—**Tubeless Tire Mounting Band**

3. Align the balance mark on the tire with the valve on the wheel.

4. Hold the beads against the rim flanges by positioning a tire mounting band over the tire (Fig. 5). If a mounting band is not available, tie a torniquet of heavy cord around

the circumference of the tire. Tighten the cord with a tire iron. Center the tire on the wheel with a rubber mallet.

5. Give the tire a few quick bursts of air to seat the beads properly, then inflate the tire to 40 pounds pressure. Check to see that the bead positioning rings (outer rings near the side walls) are evenly visible just above the rim flanges all the way around the tire. If the rings are not even, deflate the tire completely and inflate it again.

6. When the rings are properly positioned, deflate the tire to the recommended pressure.

WHEEL AND TIRE INSTALLATION

1. Clean all dirt from the hub and drum or rotor.

2. Position the wheel and tire assembly on the hub and drum or rotor. Install the wheel lug nuts and tighten them alternately in order to draw the wheel evenly against the hub and drum or rotor.

3. Lower the vehicle to the floor, and torque the lug nuts to specification (Part 3-6).

4 MAJOR REPAIR OPERATIONS

HOISTING INSTRUCTIONS

Damage to suspension and/or steering linkage components may occur if care is not exercised when positioning the hoist adapters of 2 post hoists prior to lifting the vehicle.

If a 2 post hoist is used to lift the vehicle, place the adapters under the front suspension lower arms. **Do not allow the adapters to contact the steering linkage.**

FRONT WHEEL GREASE SEAL AND BEARING REPLACEMENT AND/OR REPACKING

If bearing adjustment will not eliminate looseness or rough and noisy operation, the hub and bearings should be cleaned, inspected, and repacked. If the bearing cups or the cone and roller assemblies are worn or damaged, they should be replaced.

DRUM BRAKES

1. Raise the vehicle until the wheel and tire clear the floor.

2. Remove the wheel cover or hub cap. Remove the grease cap from the hub. Remove the cotter pin, nut lock, adjusting nut, and flat washer from the spindle. Remove the outer bearing cone and roller assembly (Fig. 1).

3. Pull the wheel, hub, and drum assembly off the wheel spindle.

4. Remove the grease retainer and the inner bearing cone and roller assembly from the hub with a drift.

5. Clean the lubricant off the inner and outer bearing cups with solvent and inspect the cups for scratches, pits, excessive wear, and other damage. If the cups are worn or damaged, remove them with a drift. Thoroughly clean the inner outer bearing cones and rollers with solvent, and dry them thoroughly. **Do not spin the bearing with compressed air.**

7. Inspect the cone and roller assemblies for wear or damage, and replace them if necessary. **The cone and roller assemblies and the bearing cups should be replaced as a unit if damage to either is encountered.**

8. Thoroughly clean the spindle and the inside of the hub with solvent to remove all old lubricant.

Cover the spindle with a clean cloth, and brush all loose dust and dirt from the brake assembly. **To prevent getting dirt on the spindle, carefully remove the cloth from the spindle.**

9. If the inner and/or outer bearing cups(s) were removed, install the replacement cup(s) in the hub with the tool shown in Figs. 6 or 7. **Be sure to seat the cups properly in the hub.**

10. Pack the inside of the hub with specified wheel bearing grease. Add lubricant to the hub only until the grease is flush with the inside diameter of both bearing cups (Fig. 8).

11. All old grease should be completely cleaned from the bearings before repacking them with new grease. Pack the bearing cone and roller assemblies with wheel bearing grease. A bearing packer is desirable for this operation. If a packer is not available, work as much lubricant as possible between the rollers and cages. Lubricate the cone surfaces with grease.

12. Apply wheel bearing grease around the circumference of the grease retainer seal lip. Place the inner bearing cone and roller assembly in the inner cup, and install the new grease retainer with the reverse end of the tool shown in Figs. 6 to 7. **Be sure that the retainer is properly seated.**

13. Install the wheel, hub, and drum assembly on the wheel spindle. **Keep the hub centered on the spindle to prevent damage to the grease retainer or the spindle threads.**

14. Install the outer bearing cone and roller assembly and the flat washer on the spindle; then, install the adjusting nut (Fig. 1).

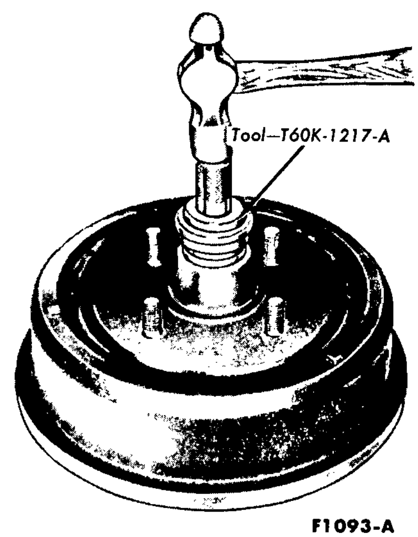


FIG. 6—Installing Front Wheel Bearing Cup—Falcon 6-Cylinder

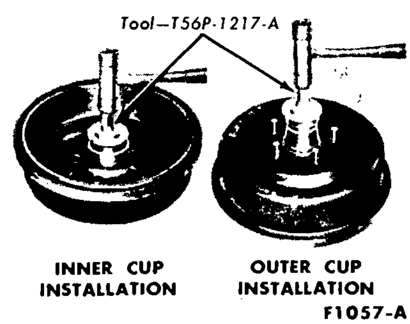


FIG. 7—Installing Front Wheel Bearing Cup—All Fairlane, Comet, and Mustang and 8-Cylinder Falcon

15. Adjust the wheel bearings as outlined in Section 2, and install a new cotter pin. Bend the ends of the cotter pin around the castellations of the nut lock to prevent interference with the radio static collector in the grease cap. Install the grease cap.

16. Install the hub cap or wheel cover.

DISC BRAKES

1. Raise the vehicle until the wheel and tire clear the floor.
2. Remove the wheel cover or hub cap.
3. Remove the wheel and tire from the hub.
4. Remove 2 bolts attaching the caliper to the caliper bracket. Remove the caliper from the rotor and wire it to the underbody to prevent damage to the brake hose.
5. Remove the grease cap from the hub. Remove the cotter pin, nut lock, adjusting nut, and flat washer from the spindle. Remove the outer bearing cone and roller assembly (Fig. 2).
6. Pull the hub and rotor off the wheel spindle.
7. Remove the grease retainer and the inner bearing cone and roller assembly from the hub.
8. Clean the lubricant off the inner and outer bearing cups with solvent and inspect the cups for scratches, pits, excessive wear, and other damage. If the cups are worn or damaged, remove them with a drift.
9. Thoroughly clean the inner and outer bearing cones and rollers with solvent, and dry them thoroughly. **Do not spin the bearings with compressed air.**

Inspect the cone and roller assemblies for wear or damage, and replace them if necessary. **The cone and roller assemblies and the bearing cups should be replaced as a unit if damage to either is encountered.**

10. Thoroughly clean the spindle and the inside of the hub with solvent to remove all old lubricant.

Cover the spindle with a clean cloth, and brush all loose dust and dirt from the brake assembly. **To prevent getting dirt on the spindle carefully remove the cloth from the spindle.**

11. If the inner and / or outer bearing cup(s) were removed, install the replacement cup(s) in the hub with the tool shown in Figs. 6 or 7. **Be sure to seat the cups properly in the hub.**
12. Pack the inside of the hub with specified wheel bearing grease. Add lubricant to the hub only until the grease is flush with the inside diameter of both bearing cups. **It is important that all the old grease be removed from the wheel bearings and surrounding surfaces because the new Lithium base grease (ESA-M1075-A) is not compatible with Sodium base grease which may already be present on the bearing surfaces.**
13. Pack the bearing cone and roller assemblies with wheel bearing grease. A bearing packer is desirable for this operation. If a packer is not available, work as much lubricant as possible between the rollers and cages. Lubricate the cone surfaces with grease.
14. Apply wheel bearing grease between the grease retainer lips. Place the inner bearing cone and roller assembly in the inner cup, and install the new grease retainer with the reverse end of the tool shown in Figs. 6 or 7. **Be sure that the retainer is properly seated.**
15. Install the hub and rotor on the wheel spindle. **Keep the hub centered on the spindle to prevent damage to the grease retainer bearing cups, or the spindle threads.**
16. Install the outer bearing cone and roller assembly and the flat washer on the spindle; then, install the adjusting nut.
17. Position the caliper over the rotor and install and torque the 2 attaching bolts.
18. Install the wheel and tire on the hub.
19. Adjust the wheel bearings as outlined in Section 2, and install a new cotter pin. Bend the ends of the cotter pin around the castellations of the nut lock to prevent interference with the radio static collector in the grease cap. Install the grease cap.
20. Install the hub cap or wheel cover and lower the vehicle.

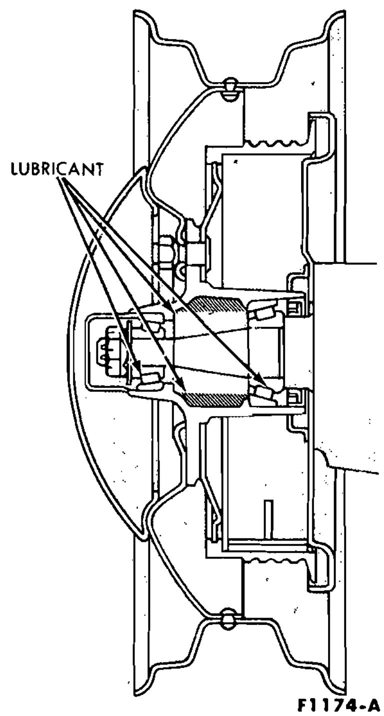


FIG. 8—Front Wheel Hub Lubrication—Typical

FRONT HUB AND DRUM REPLACEMENT

When the hub and drum assembly is replaced, new grease retainers must be installed in the new assembly. The new grease retainer sealing surfaces should be coated with wheel bearing grease.

1. Raise the vehicle until the wheel and tire clears the floor. Pry off the hub cap or wheel cover, and remove the wheel and tire assembly from the hub and drum assembly.
2. Remove the grease cap from the hub. Remove the cotter pin, nut lock, adjusting nut, and flat washer from the spindle. Remove the outer bearing cone and roller assembly (Fig. 1).
3. Pull the wheel, hub, and drum assembly off the wheel spindle.
4. Remove the protective coating from the new hub and drum with carburetor degreaser. Install new inner and outer bearing cups in the new hub with the tool shown in Figs. 6 or 7. **Be sure to seat the cups properly in the hub.**
5. Pack the inside of the hub with specified wheel bearing grease. Add lubricant to the hub only until the grease is flush with the inside diameter of both bearing cups (Fig. 8).
6. All old grease should be completely cleaned from the bearings before repacking them with new grease. Pack the bearing cone and roller assemblies with wheel bearing grease. A bearing packer is desirable for this operation. If a packer is not available, work as much lubricant as possible between the rollers and cages. Lubricate the cone surfaces with grease.
7. Place the inner bearing cone and roller assembly in the inner cup, and install the new grease retainer with the reverse end of the tool shown in Fig. 6 or 7. **Be sure that the retainer is properly seated.**
8. Install the new hub and drum assembly on the wheel spindle. **Keep the hub centered on the spindle to prevent damage to the grease retainer.**
9. Install the outer bearing cone and roller assembly and the flat washer on the spindle; then, install the adjusting nut (Fig. 1).
10. Position the wheel and tire assembly on the new hub and drum assembly. Install the wheel lug nuts and tighten them alternately in order to draw the wheel evenly against the hub and drum. Do not exceed specifications (Part 3-6).
11. Adjust the wheel bearings as outlined in Section 2, and install a new cotter pin. Bend the ends of the

cotter pin around the castellations of the nut lock to prevent interference with the radio static collector in the grease cup. Install the grease cup.

12. Install the hub cap or wheel cover.

FRONT HUB AND ROTOR REPLACEMENT

When the hub and rotor assembly is replaced, new grease retainers must be installed in the new assembly. The new grease retainer sealing surfaces should be coated with wheel bearing grease.

1. Raise the vehicle until the wheel and tire clears the floor. Pry off the hub cap or wheel cover, and remove the wheel and tire assembly from the hub and rotor.

2. Remove 2 bolts attaching the caliper to the caliper bracket. Remove the caliper from the rotor and wire it to the underbody to prevent damage to the brake hose.

3. Remove the grease cap from the hub. Remove the cotter pin, nut lock, adjusting nut, and flat washer from the spindle. Remove the outer bearing cone and roller assembly (Fig. 2). Pull the hub and rotor off the wheel spindle.

4. Remove the protective coating from the new hub and rotor with carburetor degreaser.

5. Pack the inside of the hub with specified wheel bearing grease. Add lubricant to the hub only until the grease is flush with the inside diameter of both bearing cups.

6. All old grease should be completely cleaned from the bearings before repacking them with new grease. Pack the bearing cone and roller assemblies with wheel bearing grease. A bearing packer is desirable for this operation. If a packer is not available, work as much lubricant as possible between the rollers and cages. Lubricate the cone surfaces with grease.

7. Place the inner bearing cone and roller assembly in the inner cup, and install the new grease retainer with the reverse end of the tool shown in Figs. 6 or 7. **Be sure that the retainer is properly seated.**

8. Install the new hub and rotor assembly on the wheel spindle. **Keep the hub centered on the spindle to prevent damage to the grease retainer.**

9. Install the outer bearing cone and roller assembly and the flat washer on the spindle; then, install the adjusting nut (Fig. 2).

10. Position the caliper over the rotor and install and torque the attaching bolts. Install lock wire if applicable.

11. Position the wheel and tire assembly on the new hub and rotor. Install the wheel hub nuts and tighten them alternately in order to draw the wheel evenly against the hub and rotor. Do not exceed specifications (Part 3-6).

12. Adjust the wheel bearings as outlined in Section 2, and install a new cotter pin. Bend the ends of the cotter pin around the castellations of the nut lock to prevent interference with the radio static collector in the grease cap. Install the grease cap.

13. Install the hub cap or wheel cover.

PART 3-6—Specifications

FRONT WHEEL ALIGNMENT

Car Model	Alignment Factors	Dimension "C" Inches	Dimension "D" Inches	Minimum	Maximum	Maximum Variation Between Wheels	Optimum Resetting Specifications Desired Alignment
Comet ② Falcon ② and Fairlane ②	Caster	6.50	6.72	-1 1/2°	+1/2°	1/2°	-1°
	Camber			-1/2°	+1°	1/2°	+1/2°
	Toe-in Inches	—	—	1/8	1/4	—	3/16
Mustang ③ and Cougar ③	Caster	6.30	5.50	-3/4°	+1 1/4°	1/2°	+1°
	Camber			+1/4°	+1 3/4°	1/2°	+1°
	Toe-in Inches	—	—	1/16	5/16	—	3/16

① "C" Dimension is from corner of lower flange of frame sidemember front to center of bolt head (376250—S8 strut mounting bolt).
"D" Dimension is the vertical distance between bottom of sidemember at center of axle bumper bracket and top of axle housing

② "C" Dimension is the vertical distance between bottom surface of spring tower on centerline of rebound bumper bolt and point on flat surface of upper suspension arm midway between ball joint rivets.
"D" Dimension is the vertical distance between bottom of side member and top of axle housing.

③ "C" Dimension is the vertical distance between point on underside of crossmember pocket and point on top of drag strut.
"D" Dimension is from axle housing to surface on sidemember immediately behind axle bumper.

FRONT WHEEL TURNING ANGLE

Car Model	Turning Angle of Outside Wheel With Inside Wheel Turned 20
Comet, Falcon and Fairlane	17-3/4°
Mustang and Cougar	18-3/4°

BALL JOINTS—RADIAL PLAY

Car Model and Description	Radial Play—Max. Allowable
Comet, Falcon, Fairlane and Mustang, Lower Ball Joint	Replace if Perceptibly Loose
Upper Ball Joint	0.250 Inch

WHEELBASE AND TREAD WIDTH—INCHES

Car Model	Wheelbase	Tread Width (Inches) Front	Rear
Comet and Fairlane (Except Station Wagon)	116	58.5	58.2
Falcon (Except Station Wagon)	110.9	58	58
Comet, Falcon and Fairlane Station Wagons	113	58.1 ① 58.4 ②	58 ① 58.1 ②
Mustang 200 CID	108	57.9	57.9
289 CID	108	58.1	58.1
390 CID	108	58.5	58.5
Cougar 289 CID	111.1	58.1	58.1
390 CID	111.1	58.5	58.5

① Falcon
② Comet and Fairlane

TORQUE LIMITS—FRONT SUSPENSION
COMET, FALCON, FAIRLANE, MUSTANG AND COUGAR

Description	Ft-Lbs	
	Comet, Falcon, Fairlane	Mustang and Cougar
Shock Absorber Upper Attachment	20–28	10–15
Shock Absorber Upper Bracket to Body	8–13	8–16
Front Suspension Compression Bumper to Body	12–17	12–17
Brake Backing Plate to Spindle	28–42	28–42
Upper Arm and Inner Shaft to Body	75–100	75–100
Spring Seat to Upper Arm	17–25	17–25
Shock Absorber to Spring Seat	12–17	12–17
Ball Joint to Spindle (Upper and Lower)	60–90 ①	60–90 ①
Wheel Bearing Adjusting Nut	17–25 ①	17–25 ①
Strut to Lower Arm	55–170	55–70
Lower Arm to Underbody	75–100	75–100
Stabilizer Bar Mounting Bracket to Underbody	11–16	17–25
Strut to Underbody	60–80	60–80
Stabilizer Bar to Lower Arm	5–10	5–11
Caliper Adapter to Spindle (Disc brake)	28–42	28–42
Caliper Adapter to Caliper (Disc brake)	45–60	45–60

① Torque the adjusting nut to 17–25 ft-lb. Locate nut lock on adjusting nut so castellations are aligned with cotter pin hole in spindle. Then, back off adjusting nut and nut lock so the next castellation aligns with the cotter pin hole.

COMET, FALCON, FAIRLANE, MUSTANG AND COUGAR (Ft-Lbs) — REAR SUSPENSION

Description		Comet, Falcon, Fairlane	Mustang and Cougar
Spring Shackle Bars to Body and Spring		15–22	15–22
Shock Absorber to Upper Mounting Bracket		15–25	15–25
Shock Absorber to Spring Clip Plate		15–25	15–25
Spring to Axle U-Bolt Nut		30–45	30–45
Wheel Lug Nut:	4-Lug Wheel	55–85	–
	5-Lug Wheel	70–115	70–115
Spring to Spring Front Hanger - Bolt		90–120	–
Spring to Spring Front Hanger - Nut		40–60	30–50
Universal Joint U-Bolt Nut - 6 Cylinder		7–10	7–10
Universal Joint U-Bolt Nut - 8 Cylinder		–	12–15

MANUAL STEERING GEAR

Car Line and Model	Mustang		Mustang and Cougar			Falcon	Comet Fairlane
	SMB-A	SMB-B Special Handling	SMB-C	SMB-D	SMB-E Special Handling	SMB-F Special Handling	SMA-C
Type	Recirculating Ball						
Ratio	19.9:1	16:1	19.9:1	19.9:1	16:1	16:1	22:1
Turns of Steering Wheel (Lock to Lock) ①	4 5/8	3 3/4	4 5/8	4 5/8	3 3/4	3 3/4	5
Lube Type	C3AZ-19578-A						
Lube Capacity—Lbs	.5 ± .05	.5 ± .05	.5 ± .05	.5 ± .05	.5 ± .05	.5 ± .05	.7 ± .07

① Gear Only—Not attached to Pitman Arm.

POWER STEERING GEAR

Car Line and Model	Mustang SMB-B	Mustang–Cougar SMB-E	Comet–Falcon Fairlane SMA-A	Comet Fairlane SMA-B
Type	Recirculating Ball			
Ratio		16.1:1		
Turns of Steering Wheel (Lock to Lock) ①	3-3/4	3-3/4	4	4
Lube Type		C3AZ-19578-A		
Lube Capacity—Lbs	.5 ± .05		.7 ± .07	
① Gear Only—Not attached to Pitman Arm				

STEERING GEAR ADJUSTMENTS

Description		Manual Steering All Vehicles	Power Steering All Vehicles
Sector Shaft End Play — Steering Linkage Disconnected		No Perceptible End Play	
Worm Bearing Preload		4–5 in-lbs ①	3–4 in-lbs ①
Total Preload—Mesh Load Plus Worm Bearing Preload (Pull to Rotate Worm Past Center High Spot)		9–10 in-lbs	8–9 in-lbs
Sector Adjusting Screw Head to End of Sector Shaft Maximum Clearance		0.002 inch Maximum	0.002 inch Maximum
Normal Fluid Pressure Against Either Stop (Engine @ 1000 rpm)		—	750–900 psi
Control Valve Spool Travel (From Center)			0.060 Approx.
Power Steering Belt Tension Using Tool BT-33-73F:	New Used		120–150 lbs 90–120 lbs

① Torque required to turn input shaft at approximately 1 1/2 turns either side of center (gear out of vehicle or Pitman arm disconnected.).
② Total (meshload plus worm bearing preload) must be a minimum of 2 in-lbs greater than worm bearing preload.

STEERING GEAR AND COLUMN TORQUE LIMITS (FT-LBS)

Description		Comet, Falcon, Fairlane	Mustang and Cougar
Sector Shaft Cover Bolts		17–25	15–22
Meshload Adjusting Screw Locknut		32–40	32–40
Ball Return Guide Clamp Screw (in-lbs)	Power Steering	18–42	—
	Manual Steering	42–60	18-42
Preload Adjuster Locknut—Manual Steering		60–80 ①	45–60 ②
Gear Cover to Gear Housing—Power Steering		—	—
Steering Column		—	—
Steering Wheel Attaching Nut		20–30	20–30
Bracket to Lower Clamp (Under Hood)		—	—
Lower Clamp Bracket to Dash Panel (Under Hood)		—	—
Steering Column to Support Bracket (Instrument Panel)		9–13	9–13
Steering Column Shift Arm to Linkage		20–35	—
Tilt Wheel Column Flange Screws		—	—
Neutral Switch Actuator to Shift Tube (In-Lbs)		—	18–30
Steering Shaft Flex Coupling Bolt		25–35	25–35
Seal Retainer to Dash Panel		16–22	—
Steering Column to Clutch and Brake Pedal Support		—	—

① Residual Torque Must Be 40 Ft-Lbs Min.
② Residual Torque Must Be 35 Ft-Lbs Min.

STEERING LINKAGE TORQUE LIMITS (FT-LBS)

Description		Comet, Falcon, Fairlane	Mustang and Cougar
Cylinder Mounting Bracket to Underbody	(Side Hole)	28–35	28–35
or Frame	(Bottom Hole)	35–43	35–43
Power Cylinder to Bracket		18–24	18–24
Power Cylinder to Bracket Lock Nut		3–5	3–5
Steering Spindle Arm Connecting Rod End to Spindle Arm		30–40	30–40 ①
Idler Arm Mounting Bracket to Underbody or Frame		28–35	28–35
Pitman Arm to Steering Arm-to-Idler Arm Rod or to Valve and Link Assembly		35–47 ①	35–47 ①
Steering Spindle Arm Connecting Rod to Arm-to-Idler Arm Rod		30–40 ①	30–40
Steering Gear to Side Rail or Frame		50–65	50–65
Pitman Arm to Sector Shaft		150–225	85–110 ②
Idler Arm to Pitman Arm-to-Idler Arm Rod		60–80 ①	60–80 ①
Spindle Arm Connecting Rod and End Clamp to Adjusting Sleeve		10–14	10–14
Pitman Arm to Center Link Attaching Nut		35–47	35–47
Spindle Arm to Tie Rod Attaching Nut		30–40	30–46

① Torque to low limit of specification; then, tighten the nut to the nearest cotter pin slot and insert the cotter pin.
② For all except 390 CID. For 390 CID equipped cars, torque to 150–225.

POWER STEERING PUMP—TORQUE LIMITS (FT-LBS)

Description			Comet, Fairlane, Falcon Mustang & Cougar
Pump Rear Mounting Nut (8 - Cylinder)			20–30
Outlet Fitting Hex Nut			43–47
Pressure Hose Nut			18–25
Pump to Bracket Attaching Bolts			30–40
Bracket to Engine Attaching Bolts	6-Cylinder		7–10
	8-Cylinder	289 CID	18–25
		390 CID	30–40
Bracket to Cylinder Head (8-Cylinder)			25–35
Belt Adjustment Bolt (8-Cylinder)			25–35
Bracket to Engine Adapter (6-Cylinder)			17–25
Engine Adapter to Engine (6-Cylinder)			17–25
Support Brace to Bracket (6-Cylinder)			30–40

TIRE INFLATION—COMET

Model	Tire Usage	Recommended Tire Inflation (Cold) Front	Rear	Full Rated (Max) Load (Pounds)	Passenger and Luggage Equivalent of Full Rated (Max) Load
Convertibles with Bucket Seats, Sedans, and Hardtops	200 or 289 CID Engine 7.35 x 14	24	26	Sedans & Hardtops with Bench Seats 1100	Driver + 5 Pass. and 200 lbs. Luggage
Convertibles with Bench Seat	200 or 289 CID Engine 7.35 x 14 7.75 x 14	24	26	Convertible with Bench Seats 950	Driver + 4 Pass. and 200 lbs. Luggage
Sedans without Air Conditioning	390 CID Engine 7.35 x 14	24	26	Bucket Seat Models 800	Driver + 3 Pass. and 200 lbs. Luggage
Sedans with Air Conditioning, Hardtops and Convertibles	390 CID Engine 7.75 x 14	26	26		
Station Wagons	200 or 289 CID Engine 7.75 x 14	22	32	Station Wagons 1200	Driver + 5 Pass. and 300 lbs. Luggage or Driver + 7 Pass.
	390 CID Engine 7.75 8 Ply Rating or 7.75 x 14	22	34		
GT Models	390 CID Engine 7.75 x 14 High Speed Capability Design	28	28		

TIRE INFLATION—FALCON

Model	Tire Usage	Recommended Tire Inflation (Cold)		Full Rated (Max) Load (Pounds)	Passenger and Luggage Equivalent of Full Rated (Max) Load
		Front	Rear		
All Models except Station Wagon	All Engines 6.95 x 14	24	26	1075	Driver + 5 Pass. + 175 lbs. Luggage
Station Wagon	All Engines 7.75 x 14	22	32	1200	Driver + 5 Pass. + 300 lbs. Luggage

TIRE INFLATION—COUGAR

Model	Tire Usage	Recommended Tire Inflation (Cold)		Full Rated (Max) Load (Pounds)	Passenger and Luggage Equivalent of Full Rated (Max) Load
		Front	Rear		
All Models (Except as noted below)	Standard Except GT Option 7.35 x 14	24	24	775	Driver + 3 Pass. and 175 lbs. Luggage
	Optional instead of 7.35 x 14 F70 x 14	28	28		
GT Models and Other Vehicles High Speed Tires	Standard with GT Option F70 x 14	28	28		

TIRE INFLATION—MUSTANG

Model	Tire Usage	Recommended Tire Inflation (Cold)		Full Rated (Max) Load (Pounds)	Passenger and Luggage Equivalent of Full Rated (Max) Load
		Front	Rear		
All Models (Except GT)	200 and 289 CID Engine 6.95 x 14	24	24	1075	Driver + 3 Pass. + 175 lbs. Luggage
	390 COD Engine 7.35 x 14	24	24	775	
GT Models	F70 x 14 High Speed Capability Design	28	28		

SERVICE TOOLS

Ford Tool No.	Description
T57L-500-A	Bench Mounted Holding Fixture
T56P-1217-A	Front Hub Bearing Cup and Grease Seal Replacer
T60K-1217-A	Front Hub Bearing Cup and Grease Seal Replacer
T65P-3000-E or F	Alignment Spacers
T57P-3006-A	Spindle Ball Joint Assembly Remover Press
T60K-3006-A	Spindle Ball Joint Press Adapter Screw
TOOL-3290-C	Tie Rod Ball Ends and Control Valve Ball Stud Remover
T62F-3576-A	Sector Shaft Bushing Remover and Replacer
T64K-3576-A	Sector Shaft Needle Bearings and Seal Remover and Replacer
T64K-3576-B	Sector Shaft Needle Bearings and Seal Remover and Replacer Adapter
T64P-3590-F	Steering Arm Remover
TOOL-3600-AA	Steering Wheel Remover
T65P-3A733-A	Power Steering Pump Pulley Replacer

Ford Tool No.	Description
T63P-5310-A (TOOL-5310-C)	Front Coil Spring Remover and Replacer
T64K-5310-A	Front Coil Spring Remover and Replacer Adapter (For T63P-5310-A)
T64K-5310-B	Front Coil Spring Remover and Replacer Adapter (For TOOL-5310-C)
T66P-5310-A	Front Coil Spring Remover and Replacer Adapter (For T63 P-5310-A)
T66P-5310-B	Front Coil Spring Remover and Replacer Adapter (For TOOL-5310-C)
T64N-5781-A	Rear Spring Front Bushing Remover and Replacer
T64K-5781-B	Rear Spring Bushing Adapter
T63L-8620-A	Belt Tension Gauge
T63L-10300-B	Pulley Remover
T56L-33610-D	Power Steering PupPressure Gauge

Rear Axle

GROUP 4

PART 4-1—*General Axle Service*

1 DIAGNOSIS AND TESTING

DIAGNOSIS GUIDE

Certain rear axle and drive line trouble symptoms are also common to the engine, transmission, tires, and other parts of the vehicle. For this reason, be sure that the cause of the trouble is in the rear axle before adjusting, repairing, or replacing anyof the axle parts. Refer to Fig. 23, Rear Axle Diagnosis Guide.

REAR AXLE NOISE DIAGNOSIS

Noise characteristics in a rear axle are more difficult to diagnose and repair than mechanical failures. Slight axle noise heard only at a certain speed or under remote conditions must be considered normal. Axle noise tends to peak or be more pronounced at varying speeds and the noise is in no way a sign of trouble in the axle.

Where noise is present in an objectionable form, loud and/or at all speeds, the first efforts should be made to isolate the noise. Rear axle noise is quite often confused with other noises such as tire noise, transmission noise, driveshaft vibration and universal joint noise. Isolation of the noise in any one unit requires skill and experience. An attempt to eliminate a slight noise may baffle even the best diagnostic experts. Axle noises fall into two basic categories: gear noise and/or bearing noise.

Gear Noise

Abnormal gear noise can be recognized since it produces a cycling pitch and will be very pronounced in the speed range at which it occurs, usually under drive, float, cruise or coast conditions. Gear noise tends to peak in a narrow speed range or ranges, while bearing noise will tend to remain constant in pitch.

Bearing Noise

Defective bearings will produce a whine that is constant in pitch and varies with vehicle speed. This fact will help distinguish between bearing and/or gear noise.

1. Pinion bearing noise can be identified as a constant grinding noise. Pinion bearings are rotating at a higher speed than differential side bearings or axle shaft bearings. The noise is most noticeable at a slight pull between 18 to 25 miles per hour.

2. Wheel bearing noise may be confused with rear axle noise. To differentiate between wheel bearings and rear axle, drive the vehicle on a smooth road at medium low speed. With traffic permitting, turn the vehicle sharply right and left. If noise is caused by wheel bearings, the noise will increase on the defective bearing because of side loading.

3. Side bearings will produce a constant grinding noise of a slower nature than pinion bearing, (side bearing noise cannot be determined by the wheel bearing test), but will be in the same frequency as axle shaft bearings.

Also, certain trouble symptoms are common to both the conventional and limited slip differential axles, while still other symptoms are found only in the limited slip differential.

To determine whether the vehicle is equipped with a conventional or a

limited slip differential, check the vehicle warranty plate and the axle ratio tag. Refer to VEHICLE IDENTIFICATION at the front of this manual.

LIMITED-SLIP DIFFERENTIAL

The limited-slip differential can be checked for proper operation without removing the carrier from the axle housing.

Jack up one rear wheel and remove the wheel cover. On a vehicle with a removable carrier type axle, install tool T59L-4204-A on the axle shaft flange studs as shown in Fig. 1. On a vehicle with an integral carrier type axle, use tool T65K-4204-A.

Using a torque wrench of at least 200 ft-lbs capacity, rotate the axle shaft. **Be sure that the transmission is in neutral gear, one rear wheel is on the floor, and the other rear wheel is raised off the floor.** The torque required to continuously rotate the shaft should be a specified in Part 4-3. The initial breakaway torque may be higher than the continuous turning torque, but this is normal. The axle shaft should turn with even pressure throughout the check without slipping or binding.

If the torque reading is less than the specified minimum, check the differential for improper assembly.

A vehicle equipped with a limited-slip differential will always have both wheels driving. If, while the vehicle is being serviced, only one wheel is raised off the floor and the rear axle is driven by the engine, the wheel on the floor will drive the vehicle off the stand or jack.

GEAR TOOTH CONTACT PATTERN CHECK

When rolling a tooth pattern, use the special compound (tube) packed with each service ring gear and pinion set.

Paint the gear teeth and roll a pattern as described in Section 3. After diagnosing the tooth pattern as explained here, make the appropriate adjustments as outlined in Section 2.

In making a final gear tooth contact pattern check, it is necessary to recognize the fact that there are three different types of gear set, hunting, non-hunting and partial non-hunting. Each type is determined by the ratio and the number of teeth in the gears. The non-hunting and partial non-hunting types can be identified by the paint timing marks on the pinion and ring gear teeth (Part 4-2, Fig. 30). See Part 4-3 for complete identification specifications.

THE IDEAL TOOTH PATTERN

Figs. 2 and 3 show the ideal tooth pattern. **This pattern is not a rigid standard but merely a general norm.**

In general, desirable tooth patterns should have the following characteristics:

(a) The drive pattern should be fairly well centered on the tooth.

(b) The coast pattern should be centered on the tooth but may be slightly toward the toe.

(c) Some clearance between the pattern and the top of the tooth is desirable.

(d) There should be no hard lines where the pressure is high.

The individual gear set need not conform exactly to the ideal pattern in order to be acceptable. Characteristic differences between the three types of gear sets as well as differences between individual gear sets of the same type will result in patterns that are acceptable yet different from those shown in Fig. 3.

HUNTING GEAR SET

In a hunting-type gear set, any one pinion gear tooth comes into contact with all ring gear teeth. In this type, several revolutions of the ring gear are required to make all possible gear combinations.

Acceptable Pattern

The drive pattern shown in Fig. 4 was rolled on a hunting-type gear set. Since each pinion tooth came into contact with each ring gear tooth, the pattern is a result of the **combined** tooth contacts. Therefore, the pattern is uniform from tooth to tooth.

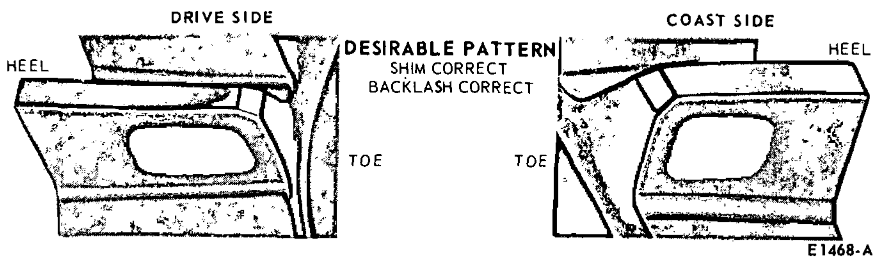


FIG. 2—Ideal Tooth Pattern—Integral Carrier Type Axle

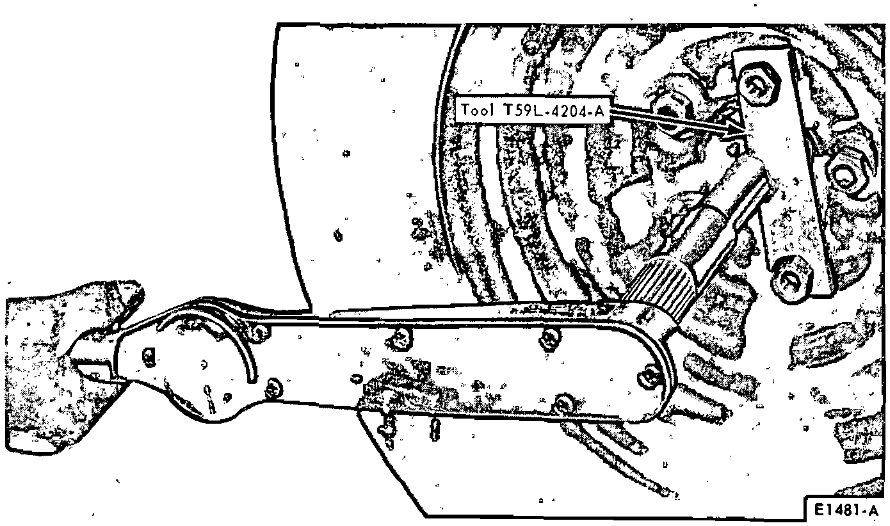


FIG. 1—Checking Limited-Slip Differential

Unacceptable Pattern

An erratic tooth pattern on a hunting gear set indicates gear runout and possible need for gear replacement.

A pattern that is uniform, but off center indicates a change in shim or backlash (Figs. 9 or 10).

NON-HUNTING GEAR SET

In a non-hunting type gear set, any one pinion gear tooth comes into contact with only a few ring gear teeth. In this type, only one revolution of

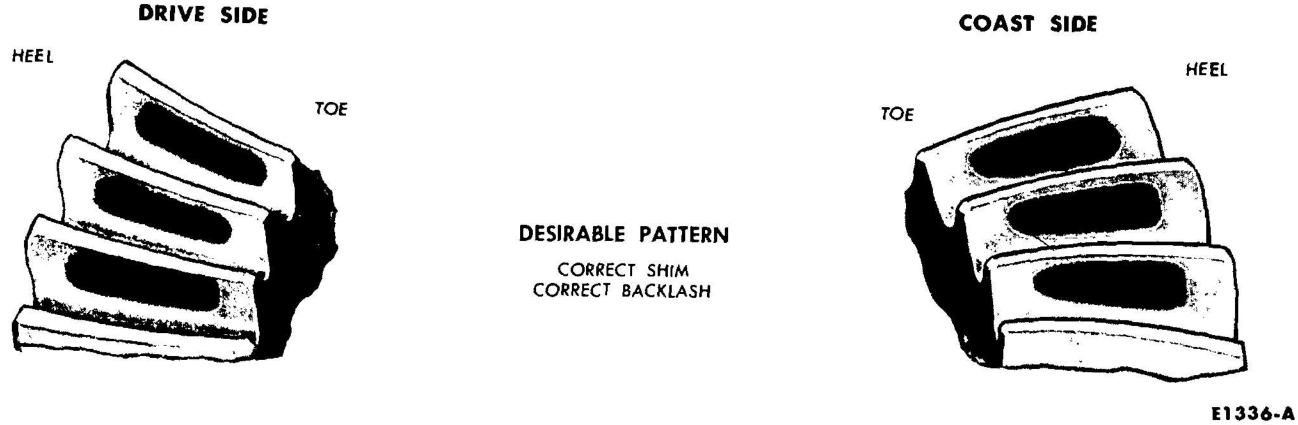


FIG. 3—Ideal Tooth Pattern—Removable Carrier Type Axle

the ring gear is required to make all possible tooth contact combinations.

Acceptable Patterns

The drive patterns shown in Figs. 5 and 6 were rolled on two different non-hunting type gear sets. The pattern in Fig. 5 runs from the tooth center toward the toe and then back to center. The pattern in Fig. 6 runs from the tooth center toward the heel and then back to center. These patterns are not unusual for non-hunting gear sets and are acceptable. The pattern on any one ring gear tooth was formed by only **one** pinion tooth coming into contact with it. Because of this limited tooth contact, the non-hunting pattern can be more erratic than the hunting pattern and still be acceptable. Likewise, the coast pattern on a non-hunting gear set is usually less uniform tooth to tooth than it would be on a hunting gear set (Fig. 7).

Fig. 8 shows a pattern rolled on another gear set. In this case, the pattern is fairly uniform from tooth to tooth.

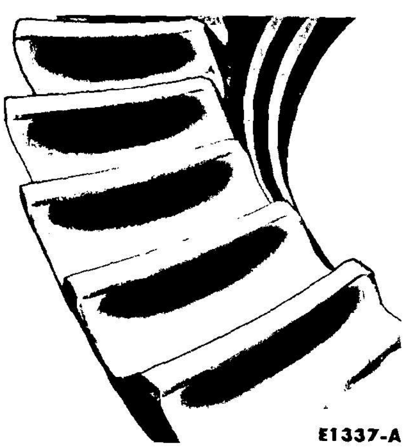


FIG. 4—Acceptable Hunting Gear Pattern

FIG. 5—Unacceptable Non-Hunting Pattern—Center-Toe-Center

FIG. 6—Unacceptable Non-Hunting Pattern—Center-Heel-Center

Unacceptable Patterns

A non-hunting gear set should be checked for runout and possible replacement if the pattern runs from the tooth center toward the toe and

FIG. 7—Acceptable Non-Hunting Gear Set—Coast Pattern

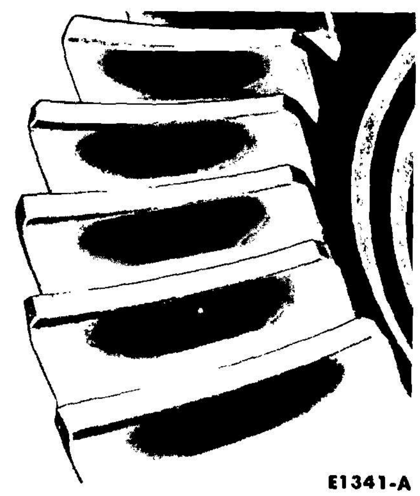


FIG. 8—Acceptable Non-Hunting Pattern—Uniform

back to center on some gear teeth (Fig. 5) while on other teeth of the same gear, the pattern runs from the tooth center toward the heel and back to center (Fig. 6).

A non-hunting gear set requires a

change in shimming or backlash when its pattern tends to concentrate toward the heel or toe, top or bottom of **most** teeth (Figs. 9 and 10).

PARTIAL NON-HUNTING GEAR SET

In a partial non-hunting type gear set, any one pinion tooth comes into contact with only part of the ring gear teeth, but more than one revolution of the ring gear is required to make all possible gear tooth combinations.

Tooth to tooth pattern uniformity will usually be in between the hunting and the non-hunting patterns. Partial non-hunting gear set patterns will usually be less uniform than hunting gear set patterns, but more uniform than non-hunting gear set patterns.

SHIM AND BACKLASH CHANGES

The patterns shown in Figs. 9 and 10 are typical of gear sets that have either an incorrect backlash or an incorrect shim adjustment. Since each gear set rolls a characteristic pattern, the patterns in Figs. 9 and 10 should be considered as typical only and should be used as a guide rather than a rigid standard. The drive pattern is rolled on the convex side of the tooth, and the coast pattern is rolled on the concave side.

The movement of tooth contact patterns with changes in backlash and shimming can be summarized as follows:

Integral Carrier Type Axle

1. Thinner shim with the backlash constant moves the pinion farther from the ring gear.

a. Drive pattern moves toward the top of the tooth (face contact) and toward the heel.

b. Coast pattern moves toward the top of the tooth and slightly toward the toe.

2. Thicker shim with the backlash constant moves the pinion closer to the ring gear.

a. Drive pattern moves deeper on the tooth (flank contact) and slightly toward the toe.

b. Coast pattern moves deeper on the tooth and toward the heel.

3. Decreasing backlash moves the drive gear closer to the pinion:

a. Drive pattern (convex side of gear) moves slightly lower and toward the toe.

b. Coast pattern (concave side of gear) moves lower and toward the toe.

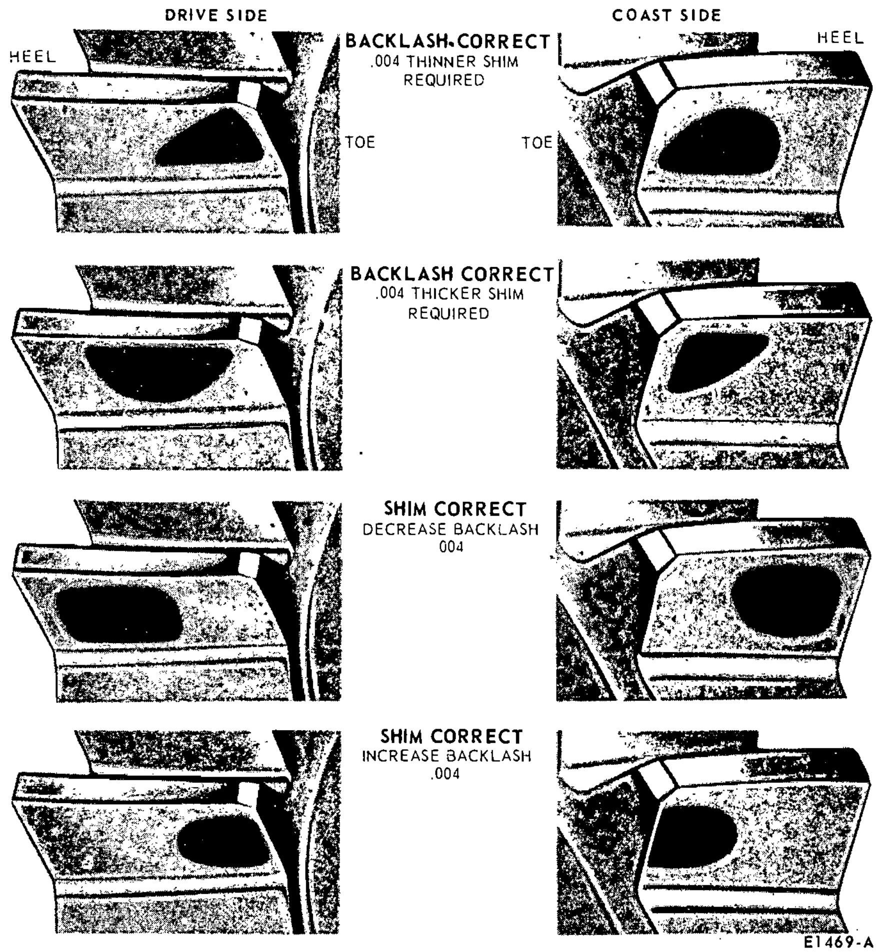


FIG. 9—Typical Gear Tooth Contact Patterns Indicating Shim or Backlash Change—Integral Carrier Type

4. Increasing backlash moves the ring gear away from the pinion:

a. Drive pattern moves slightly higher and toward the heel.

b. Coast pattern moves higher and toward the heel.

If the patterns are not correct, make the changes as indicated. The differential case and drive pinion will have to be removed from the carrier casting to change a shim. When re-installing the pinion and ring gear of a non-hunting or partial non-hunting gear set, be sure that the marked tooth on the pinion indexes between the marked teeth on the ring gear (Fig. 30, Part 4-2). Refer to Pinion and Ring Gear Tooth Contact Adjustment, Section 2.

Removable Carrier Type Axle

1. Thicker shim with the backlash constant moves the pinion farther from the ring gear:

a. Drive pattern moves toward the top of the tooth (face contact) and toward the heel.

b. Coast pattern moves toward the top of the tooth and slightly toward the toe.

2. Thinner shim with the backlash constant moves the pinion closer to the ring gear.

a. Drive pattern moves deeper on the tooth (flank contact) and slightly toward the toe.

b. Coast pattern moves deeper on the tooth and toward the heel.

3. Decreasing backlash moves the ring gear closer to the pinion:

a. Drive pattern moves slightly lower and toward the toe.

b. Coast pattern moves lower and toward the toe.

4. Increasing backlash moves the ring gear away from the pinion:

a. Drive pattern moves slightly higher and toward the heel.

b. Coast pattern moves higher and toward the heel.

If the patterns are not correct, make the changes as indicated. The pinion need not be disassembled to change a shim. All that is required is to remove the pinion, bearing, and

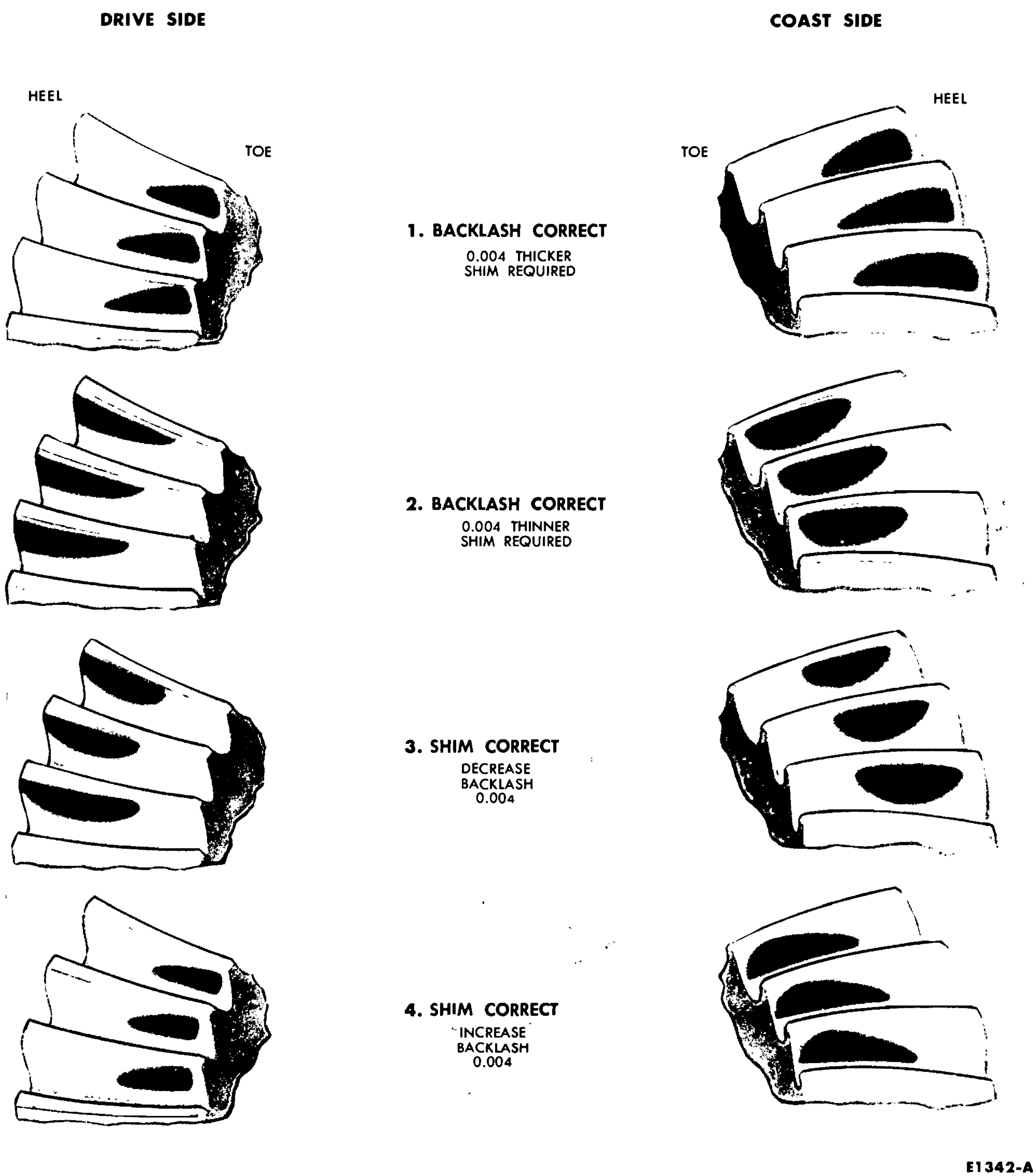


FIG. 10—Typical Gear Tooth Contact Patterns Indicating Shim or Backlash Change—Removable Carrier Type

retainer assembly and install a different shim. When reinstalling the pinion and retainer assembly of a non-hunting or partial non-hunting gear set, be sure that the marked tooth on the pinion indexes between the marked teeth on the ring gear (Fig. 30, Part 4-2). Refer to Pinion and Ring Gear Tooth Contact Adjustment, Section 2.

REAR AXLE COMPANION FLANGE RUNOUT CHECK

1. Raise the vehicle on a hoist that supports the rear axle (twin-post hoist).

2. Remove the driveshaft assembly (Group 5).

3. Check the companion flange for damage to the universal joint bearing locating lugs. If the universal joint bearing locating lugs on the companion flange are shaved (worn) or damaged, replace the companion flange Fig. 11.

4. The rear axle companion flange runout is checked with a modified universal joint (checking tool) a dial indicator with 1.000 inch minimum travel, and a cup-shaped dial indi-

cator adapter tool (Fig. 12). To fab- **ricate the checking tool, modify a universal joint assembly by removing two bearing cups that are opposite each other, and cutting or grinding off one of the universal joint bearing flanges (Fig. 12).**

5. Install the cup-shaped adapter on the dial indicator stem. Install the dial indicator on the pinion retainer or pinion nose bumper bracket. Position the indicator to allow an indication at the ends of the universal joint bearing cups and the remaining exposed journal of the cross-shaft.

6. Turn the companion flange so that the dial indicator cup-type adapter rests on the machined surface of the bearing cup (Fig. 12). Rotate the companion flange side-to-side slightly to obtain a reading indicating that the bearing cup surface is perpendicular to the indicator cup-type adapter. **This will be the point at which the dial indicator cup is closest to the center of companion flange rotation. It is also the point at which the dial indicator hand will reverse direction as the companion flange is turning.** Set the dial indicator to zero.

7. Carefully retract the dial indicator stem and rotate the companion flange 180° to position the machined surface of the opposite universal bearing under the dial indicator adapter tool. Again, slightly rotate the flange side-to-side to position the bearing perpendicular to the dial indicator adapter. Again, this is the point at which the indicator hand will reverse direction as the flange is rotated. Record the flange bearing cup runout reading obtained from the indicator (Fig. 13).

Rotate the companion flange 90° and position the dial indicator adapter on the machined end of the exposed journal (Fig. 14). **Be sure the end surface of the exposed journal is perpendicular to the indicator cup-type adapter.** This requires that the cross-shaft be moved fore and aft on the flange bearing cups. **Note the point at which the indicator hand reverses direction.** Rotate the flange assembly side-to-side until the cross-shaft is perpendicular to the pinion shaft axis, and the indicator hand reverses direction. Zero the dial indicator and check the zero point again by slightly moving the cross-shaft fore and aft, then rotate the companion flange from side-to-side.

8. With the indicator at zero, carefully retract the dial stem and rotate the flange 180°. Rotate the cross-shaft 180° on the flange bearing cups to position the exposed journal under the dial indicator adapter. Rock the cross-shaft fore and aft and the companion flange side-to-side to establish the point at which the indicator hand reverses direction. This will determine the driveshaft universal cross-shaft runout. Record this reading (Fig. 14).

9. Repeat steps 5 through 8 at least three times and average the indicator readings obtained (Fig. 13).

10. To determine the total (combined) companion flange runout, it will be necessary to use the combined runout chart (Fig. 15). Position a straight edge at the amount of flange bearing cup runout indicated on the left hand column of the chart. Position another straight edge vertically at the amount of driveshaft universal cross-shaft runout indicated on the top of the chart. The point at which the straight edges cross the chart indicates the combined rear axle flange runout. For example:

With an indicated 0.003 inch flange bearing cup runout and an indicated 0.004 inch universal cross-shaft runout (Fig. 15), the combined companion flange runout will be 0.005 inch as indicated in the square on the chart (Fig. 15).

11. If the reading obtained in Step 10 exceeds specifications, reposition the companion flange 180° on the pinion shaft and repeat steps 1 through 10.

12. If the repeat readings still exceed specifications, re-position the flange an additional 90° on the pinion shaft and check the runout (Steps 4 through 10).

13. If the runout is still excessive, replace the companion flange and

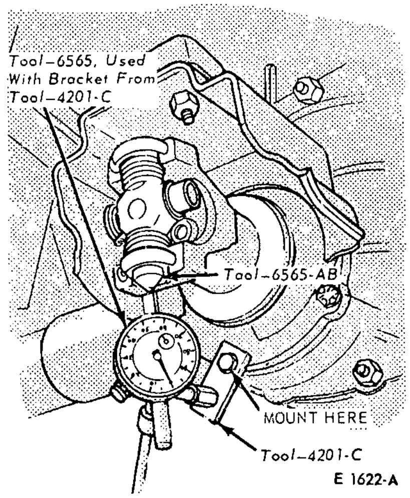


FIG. 12—Flange Bearing Cup Runout Check

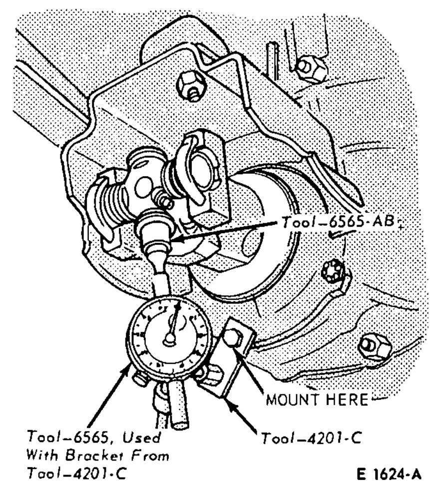


FIG. 14—Cross Shaft Runout Check

Indicator Reading	Flange Bearing Cup Runout	Drive Shaft Universal Cross-Shaft Runout
1	0.004	0.005
2	0.002	0.004
3	0.003	0.003
Average	0.003	0.004

FIG. 13—Flange Bearing Cup and Cross Shaft Runout Averaging Chart—Typical Readings

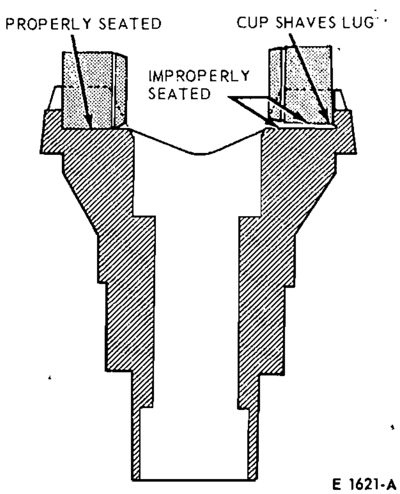


FIG. 11—Checking Companion Flange

Flange Bearing Cup Runout	Drive Shaft Universal Cross-Shaft Runout								
	0.000	**0.001**	**0.002**	**0.003**	**0.004**	**0.005**	**0.006**	**0.007**	**0.008**
0.000	0.000	0.001	0.002	0.003	0.004	0.005	0.006	0.007	0.008
0.001	0.001	0.0013	0.0022	0.0032	0.0042	0.0051	0.0061	0.0071	0.0081
0.002	0.002	0.0022	0.0027	0.0037	0.0045	0.0053	0.0062	0.0072	0.0082
0.003	0.003	0.0032	0.0036	0.0042	0.005	0.0058	0.0067	0.0077	0.0085
0.004	0.004	0.0042	0.0045	0.005	0.0057	0.0064	0.0072	0.0081	0.009
0.005	0.005	0.0051	0.0053	0.0058	0.0063	0.0071	0.0078	0.0087	0.0094
0.006	0.006	0.0061	0.0062	0.0068	0.0072	0.0078	0.0085	0.0092	0.010
0.007	0.007	0.0071	0.0073	0.0075	0.0081	0.0087	0.0093	0.0099	0.0103
0.008	0.008	0.0081	0.0082	0.0087	0.009	0.0094	0.010	0.0104	0.011
The total (combined) companion flange runout is located in the square where the columns containing the flange bearing cup runout and universal cross shaft runout readings intersect.									

FIG. 15—Companion Flange Combined Runout Chart

check the runout. If necessary, rotate the new flange on the pinion shaft until an acceptable runout is obtained.

If excessive runout is still evident after replacement of the companion flange, it will be necessary to replace the ring and pinion gear, and repeat the above checks until runout is within specifications.

14. Install the driveshaft assembly (Group 5). **Make sure the universal joint bearing cups are properly positioned between the companion flange lugs.**

15. Lower the vehicle. Road test the vehicle. If drive shaft vibrations are evident during the road test, remove the driveshaft from the companion flange and rotate it 180° Road test the vehicle again.

2 COMMON ADJUSTMENTS AND REPAIRS

PINION AND RING GEAR TOOTH CONTACT ADJUSTMENT

Two separate adjustments affect pinion and ring gear tooth contact. They are pinion location and backlash (Figs. 16 and 17).

Individual differences in matching the differential housing and the gear set require the use of shims to locate the pinion for correct contact with the ring gear. On the integral carrier type axle, the pinion locating shim pack is installed between the pinion rear bearing cone and the pinion gear (Fig. 16), whereas, on the removable carrier type axle, the shims are installed between the pinion retainer and the carrier (Fig. 17). Due to this difference in shim position, it should be noted that adding or removing shims in the integral carrier type (Fig. 16) causes the pinion to move in a direction exactly opposite to the pinion movement caused by adding or removing shims in the removable carrier type (Fig. 17).

When adjusting either type axle, shims should be added to or removed from the original shim pack only as indicated by the tooth pattern check described in the foregoing Section 1. When adjusting the integral carrier type axle, **add shims** to move the pinion **toward** the ring gear; **remove** shims to move the pinion **away** from the ring gear (Fig. 16). When adjusting the removable carrier type axle, **remove** shims to move the pinion **toward** the ring gear; add shims to move the pinion **away** from the ring gear (Fig. 17).

The tooth pattern check also indicates whether the ring gear should be adjusted away from or toward the pinion to increase or decrease backlash between the gears.

If the tooth pattern check indicates a change in backlash only, follow the procedure under Backlash and Differential Bearing Preload Adjustments. If the tooth pattern indicates a change in shim thickness, follow the procedure under Pinion Location.

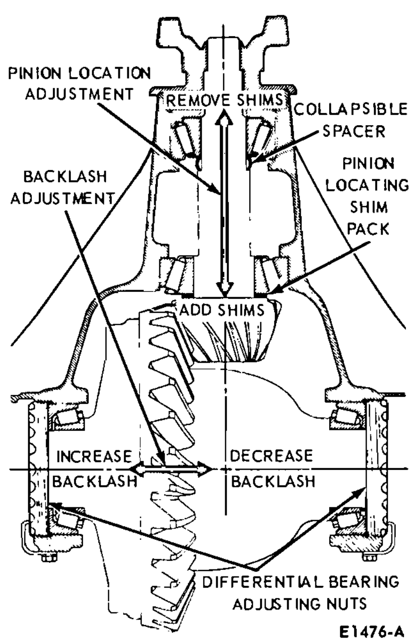


FIG. 16—Pinion and Ring Gear Tooth Contact Adjustment—Integral Carrier Type Axles

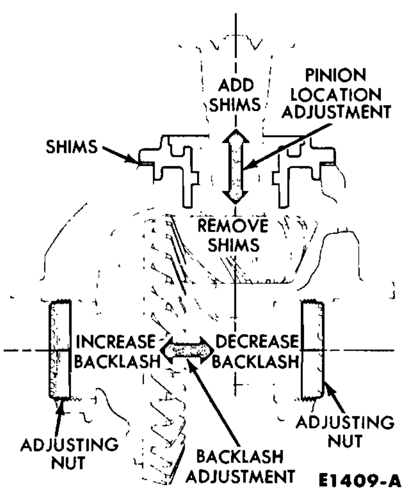


FIG. 17—Pinion and Ring Gear Tooth Contact Adjustment—Removable Carrier Type Axles

BACKLASH AND DIFFERENTIAL BEARING PRELOAD ADJUSTMENTS

To secure a more uniform control of differential side bearing preload in service repairs, a dial indicator setup such as shown in Fig. 18 is used.

In both types of axle (Fig. 16 and 17), the ring gear is moved away from or toward the pinion as described in the following procedure.

1. Remove the adjusting nut locks, loosen the differential bearing cap bolts, then torque the bolts to (15 ft-lbs on integral carrier type axles; 20 ft-lbs on removable carrier type axles) before making adjustments.

2. **The left adjusting nut is on the ring gear side of the carrier. The right nut is on the pinion side.** Loosen the right nut until it is away from the cup. Tighten the left nut until the ring gear is just forced into the pinion with no backlash then rotate the pinion several revolutions to be sure no binding is evident. (recheck the right nut at this time to be sure that it is still loose.) **Tightening the left nut moves the ring gear into the pinion to decrease backlash, and tightening the right nut moves the ring gear away.**

3. Loosen the left adjusting nut 1 to 1 1/2 notches. Tighten the right nut until it first contacts the bearing cup. Rotate the dirve gear several revolutions in each direction while the bearings are loaded, to seat the bearings in their cups to be sure no bind is evident. **This step is important.**

4. Install a dial indicator as shown in Fig. 18.

5. Again loosen the right nut to release the pre-load. If there is any backlash between the gears as shown by the dial indicator, tighten the left nut just enough to remove this backlash. At this time, make sure that one of the slots in the left nut is so located that the lock can be installed without turning the nut. Carefully tighten the right nut until it just contacts the cup.

6. Torque the differential cap bolts to specification.

On integral carrier type axles, set a preload of 0.008 to 0.012 inch case spread for new bearings and 0.003 to 0.005 for the original bearings.

On removable carrier type axles, the preload is 0.008 to 0.012 inch case spread for new bearings and 0.005 to 0.008 for the original bearings. As preload is applied from the right side, the ring gear is forced away from the pinion and usually results in the correct backlash.

7. Measure the backlash on several teeth around the ring gear. If the measurements vary more than (0.003 inch— both integral and removable carrier) there is excessive runout in the gears or their mountings, which must be corrected to obtain a satisfactory unit. If the backlash is out of specification, loosen one adjusting nut and tighten the opposite nut an equal amount, to move the ring gear away from or toward the pinion. **When moving the adjusting nuts, the final movement should always be made in a tightening direction. For example, if the left nut had to be loosened one notch, loosen the nut two notches, then tighten it one. This insures that the nut is contacting the bearing cup, and that the cup cannot shift after being put in service.** After all such adjustments, check to be sure that the case spread remains as specified for the new or original bearings used.

8. Again check the tooth contact pattern. If the pattern is still incorrect, a change in pinion location (shim thickness) is indicated.

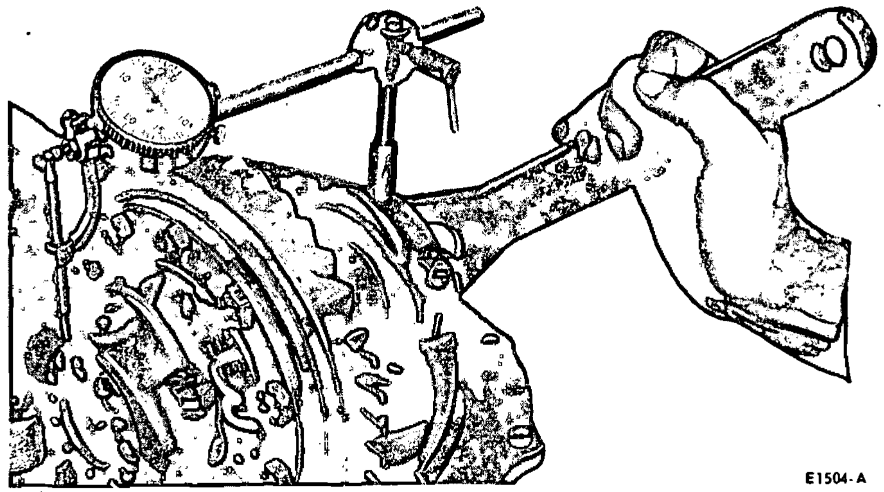


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FIG. 18—Adjusting Side Bearing Preload

PINION LOCATION

Integral Carrier Type Axle

1. Remove the differential case and the drive pinion from the carrier casting, and then remove the pinion bearings as described under Removal of Differential Case and Drive Pinion in Section 4.

2. Measure the original shim thickness with a micrometer. Increase or decrease the shim thickness as indicated by the tooth pattern check described in the foregoing Section 1 and shown in Fig. 9.

3. Install the corrected shim pack and the bearings on the pinion, and then install the pinion and the differential case in the carrier casting as outlined under Installation of Drive Pinion and Differential Case in Section 4 of Part 4-2.

4. Adjust the backlash between the ring gear and pinion as outlined in the foregoing procedure.

5. Make a tooth pattern check. If the pattern is still unsatisfactory, repeat this procedure changing the shim thickness each time until a satisfactory tooth pattern is obtained.

Removable Carrier Type Axle

1. Remove the retaining bolts and the pinion and bearing retainer assembly from the carrier.

2. Measure the original shim thickness with a micrometer. Increase or decrease the shim thickness as indicated by the tooth pattern check described in Section 1.

3. Replace the pinion retainer O-ring (Fig. 46, Part 4-2). Coat the O-ring with axle lubricant before installing. **Do not roll the O-ring into the groove. Snap it into position.**

4. Being careful not to pinch the O-ring, install the pinion and bearing retainer assembly in the carrier with the corrected shim pack.

Before installing the pinion and bearing retainer assembly, determine which type of gear set is being used. The **non-hunting** and **partial non-hunting** types can be identified by the paint timing marks on the gear teeth (Fig. 30, Part 4-2).

If the gear set is of the **non-hunting** or **partial non-hunting** type, clean the teeth on both the pinion and ring gear so that the timing marks are visible. Rotate the differential case and drive gear assembly in the car-

rier until the marked teeth on the ring gear are opposite the pinion entry hole. Place the pinion retainer assembly in the carrier so that the marked tooth on the pinion indexes between the marked teeth on the ring gear (Fig. 30, Part 4-2).

In almost every case of improper assembly (gear assembled out of time), the noise level and probability of failure will be higher than they would be when properly assembled.

When installing the **hunting** type gear set (no timing marks), assemble the pinion and retainer assembly into the carrier without regard to the matching of any particular gear teeth.

5. Install the retainer-to-carrier mounting bolts and torque to specifications.

6. Adjust the backlash between the ring gear and pinion as outlined in the foregoing procedure.

7. Make a tooth pattern check. If the pattern is still unsatisfactory, repeat this procedure changing the shim thickness each time until a satisfactory tooth pattern is obtained.

3 CLEANING AND INSPECTION

INSPECTION BEFORE DISASSEMBLY OF CARRIER

The differential case assembly and the drive pinion should be inspected before they are removed from the housing. These inspections can help to find the cause of the trouble and to determine the correction needed.

On removable carrier type axles, mount the carrier in the holding fixture shown in Fig. 19.

Wipe the lubricant from the internal working parts, and visually inspect the parts for wear or damage.

Rotate the gears to see if there is any roughness which would indicate defective bearings or chipped gears. Check the gear teeth for scoring or signs of abnormal wear.

Check the differential case and the drive pinion for end play.

Set up a dial indicator (Fig. 20 or 21) and check the backlash at several points around the ring gear.

Backlash should be within specifications as outlined in the Specifications Section, Part 4-3.

To check the gear tooth contact, paint the gear teeth with the special compound furnished with each service ring gear and pinion. Wrap a cloth around the drive pinion flange to act as a brake. Rotate the ring gear back and forth (use a box wrench on the ring gear attaching bolts for a lever) until a clear tooth contact pattern is obtained.

Certain types of gear tooth contact patterns on the ring gear indicate incorrect adjustment. Noise caused by incorrect adjustment can often be corrected by readjusting the gears.

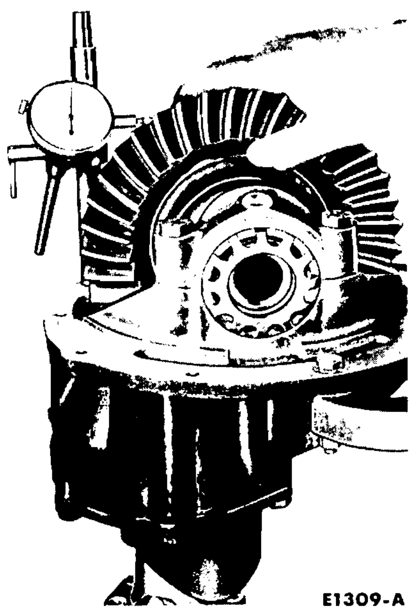


FIG. 20—Checking Backlash—Removable Carrier Type Axle

Typical patterns and the necessary corrections are explained under Gear Tooth Contact Pattern Check in Section 1.

Gear tooth runout can sometimes be detected by an erratic pattern on the teeth. However, a dial indicator should be used to measure the runout of the back face of the ring gear, as shown in Fig. 21 or 22. Refer to Specifications Section for maximum allowable runout.

Loosen the differential bearing cap bolts, and then torque to specification. Remove the adjusting nut locks.

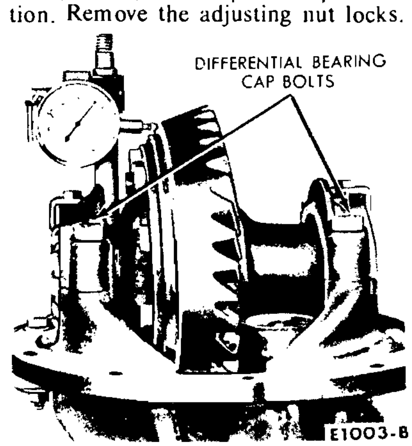


FIG. 22—Checking Ring Gear Runout—Removable Carrier Type Axle

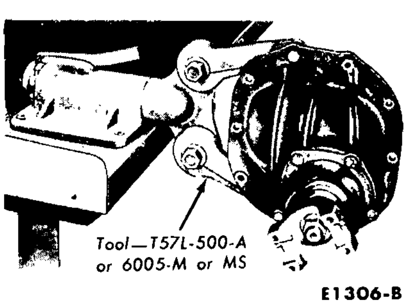


FIG. 19—Bench Fixture for Carrier Overhaul—Removable Carrier Type Axle

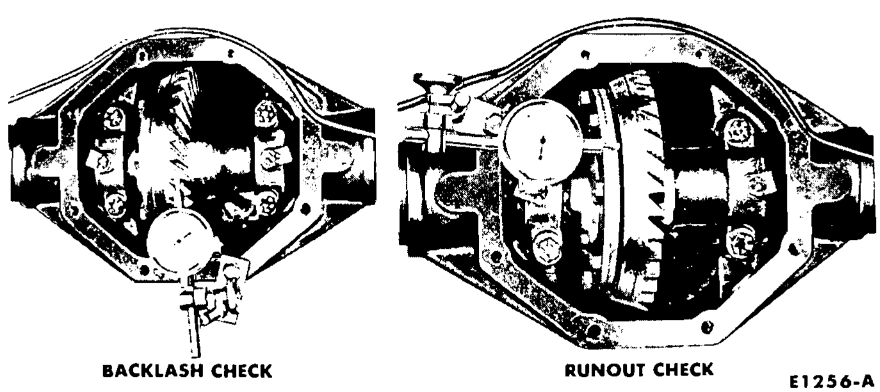


FIG. 21—Checking Backlash and Runout— Integral Carrier Type Axle

Carefully loosen one of the adjusting nuts to determine if any differential bearing preload remains. If at least one notch of preload remains, the differential bearings may be re-used, provided they are not pitted or damaged.

INSPECTION AFTER DISASSEMBLY

Thoroughly clean all parts. **Always use new solvent when cleaning bearings. Synthetic seals must not be cleaned, soaked or washed in cleaning solvent. Do not spin bearings with compressed air.** Oil the bearings immediately to prevent rusting. Inspect the parts for any major defects. Clean the inside of the housing before rebuilding and installing the parts.

When a scored gear set is replaced, the axle housing should be washed thoroughly and steam cleaned. This can only be done effectively if the axle shafts and shaft seals are removed from the housing. Inspect individual parts as outlined below.

GEARS

Examine the pinion and ring gear teeth for scoring or excessive wear. **Extreme care must be taken not to damage the pilot bearing surface of the pinion.**

The pattern taken during disassembly should be helpful in judging if gears can be re-used. Worn gears cannot be rebuilt to correct a noisy condition. Gear scoring is the result of excessive shock loading or the use of an incorrect lubricant. Scored gears cannot be re-used.

Examine the teeth and thrust surfaces of the differential gears. Wear on the hub of the differential side gear can cause a chucking noise known as chuckle when the vehicle is driven at low speeds. Wear on splines, thrust surfaces, or thrust washers can contribute to excessive drive line backlash.

BEARING CUPS, CONE AND ROLLER ASSEMBLIES

Check bearing cups for rings, scores, galling, or erratic wear patterns. Pinion bearing cups must be solidly seated. Check by attempting to insert a 0.0015-inch feeler between these cups and the bottoms of their bores.

When operated in the cups, bearing rollers must turn without roughness. Examine the roller ends for wear. Step-wear on the roller ends indicates that the bearings were not preloaded properly or that the rollers were slightly misaligned.

If inspection reveals either a defective cup or a defective cone and roller assembly, **both parts should be replaced to avoid early failure.**

DIFFERENTIAL BEARING ADJUSTING NUTS

Temporarily install the bearing caps and test the fit of the adjusting nuts in their threads.

The nuts should turn easily when the caps are tightened to 15 ft-lbs (integral carrier type) or 20 ft-lbs (removable carrier type). The faces of the nuts that contact the bearing cups must be smooth and square. Polish these with a fine abrasive on a flat surface. Replace the nuts or examine the threads in the carrier, if their fit is not proper. Be sure that the bearing caps and adjusting nuts are on the side which they were machined to fit by observing the punch marks and scribe marks made during disassembly operations.

U-JOINT FLANGE

Be sure that the ears of the flange have not been damaged in removing the drive shaft or in removing the flange from the pinion. The end of the flange that contacts the front pinion bearing inner vace (both integral and removable carrier) as well as the flat surface of the pinion nut counterbore must be smooth. Polish these surfaces if necessary. Roughness aggravates backlash noises, and causes wear of the flange and pinion nut with a resultant loss in pinion bearing preload.

PINION RETAINER—REMOVABLE CARRIER TYPE AXLE ONLY

Be sure that the pinion bearing cups are seated. Remove any chips or burrs from the mounting flange. Clean the groove for the O-ring seal and all lubricant passages. If the cups were removed, examine the bores carefully. Any nicks or burrs in these bores must be removed to permit proper seating of the cups.

CARRIER HOUSING

Make sure that the differential bearing bores are smooth and the threads are not damaged.

Remove any nicks or burrs from the mounting surfaces of the carrier housing.

DIFFERENTIAL CASE

Make sure that the hubs where the bearings mount are smooth. Carefully examine the differential case bearing shoulders, which may have been damaged when the bearings were removed. The bearing assemblies will fail if they do not seat firmly against the shoulders. Check the fit (free rotation) of the differential side gears in their counterbores. Be sure that the mating surfaces of the two parts of the case are smooth and free from nicks or burrs.

LIMITED-SLIP DIFFERENTIAL PARTS

Inspect the clutch plates for uneven or extreme wear. The dog-eared clutch plates must be free from burrs, nicks, or scratches which could cause excessive or erratic wear to the bonding material of the internally splined clutch plates. The internally splined clutch plates should be inspected for condition of the bond, bonding material, and wear. Replace the bonded plates if their thickness is less than 0.085 inch or if the bonded material is scored or badly worn. Inspect the bonded plate internal teeth for wear. Replace them, if excessive wear is evident. Bonded plates should be replaced as a set only.

Examine all thrust surfaces and hubs for wear. Abnormal wear on these surfaces can contribute to a noisy axle.

Inspect the Belleville spring for proper free height of 1/4 inch.

EXCESSIVE REAR AXLE NOISE (ALL REAR AXLES)	Since gears are in mesh, some rear axle noise is normal. However, excessive noise often indicates the beginning of other troubles in the axle. A road test can help determine whether the noise is being caused by trouble in the rear axle or in other parts of the vehicle. **Before road-testing the vehicle, make sure that the tire pressures and the rear axle lubricant level are normal. Then drive the vehicle far enough to warm the axle lubricant to its normal operating temperature.** With the vehicle stopped and the transmission in neutral, run the engine at various speeds. If the noise still exists during this test, it probably comes from the engine or the exhaust system. To determine if the noise is being caused by the rear axle or the tires, drive the vehicle over several different types of road surfaces. Smooth asphalt or black-top roads minimize tire noises. Tire noises may be eliminated by cross-switching the tires. Snow tires often cause noises not heard with conventional tires. Noise caused by a worn or damaged wheel bearing is often loudest when the vehicle is coasting at low speeds, and it usually stops when the brakes are gently applied. To find the noisy bearing, jack up each wheel and check each bearing for roughness while the wheel is rotating, provided that the vehicle is equipped with a conventional differential. If all possible external sources of noise have been checked and eliminated, and the noise still exists, road-test the rear axle under all four driving conditions—drive, cruise, float, and coast. Any noise produced by the sidegears and pinions in the differential case will be most pronounced on turns. A continuous whine under a light load between 20 and 35 miles per hour indicates rough or brinnelled pinion bearings. If the tone of drive, coast and float noise differs with speed and if the noise is very rough and irregular; worn, rough or loose differential or pinion shaft bearings are indicated. Remove, disassemble, and inspect the axle.
EXCESSIVE REAR AXLE BACKLASH (ALL REAR AXLES)	Excessive backlash in the axle driving parts may be caused by worn axle shaft splines, loose axle shaft flange nuts, loose U-joint flange mountings, excessive backlash between the drive pinion and ring gear, excessive backlash in the differential gears, or bearings which are worn or out of adjustment.
ONE WHEEL SPINS EXCESSIVELY (LIMITED-SLIP DIFFERENTIAL ONLY)	Use the procedure given under limited-slip differential for checking the locking differential while the unit is in the vehicle. If the torque required to rotate one rear wheel is less than the specified minimum, the differential is not functioning properly. To repair the unit, remove it from the axle housing.
AXLE HAS A HIGH-PITCHED, CHATTERING NOISE ON TURNS (LIMITED-SLIP DIFFERENTIAL ONLY)	Drive the vehicle in a fairly tight circle, making five circles clockwise and five counterclockwise. This will permit the lubricant to work in between the clutch plates. If the noise does not disappear during this driving test, it is probable that the axle does not have the approved Ford lubricant, or has improperly assembled differential clutch plates. The differential carrier must be disassembled, cleaned, and new friction plates installed. The axle housing must be cleaned and flushed. Note: New friction plates must be soaked for 1/2 hour in C6AZ-19580-C (ESW-M20104-A) lubricant. After refilling the axle with proper lubricant, drive the vehicle in fairly tight circles clockwise and counterclockwise. The chattering noise should disappear as soon as the new lubricant works in between the clutch plates.

FIG. 23—Rear Axle Diagnosis Guide

PART 4-2—Rear Axles

1 DESCRIPTION AND OPERATION

IDENTIFICATION

A metal tag stamped with the model designation and gear ratio is secured to all Ford-produced axles under one of the rear cover-to-housing bolts (integral carrier type) or the carrier-to-housing bolts (removable carrier type). The first five spaces on the top line are reserved for the model designation letters such as WCY-E, WDJ-C, or WEA-B. These letters indicate a specific combination of the following factors: conventional or limited-slip axle; diameter of ring gear; small or large wheel bearings; and the gear ratio. It is important, therefore, to use the model designation for obtaining the correct replacement parts.

CONVENTIONAL AXLES

DESCRIPTION

Integral Carrier Type Axle

The rear axle assembly is an integral-type housing, hypoid design, with the centerline of the pinion set below the centerline of the ring gear (Fig. 1).

The semi-floating axle shafts are retained in the housing by ball bearings and a bearing retainer at the axle housing outer ends.

The differential assembly is mounted on two opposed tapered roller bearings. The bearings are retained in the housing by removable caps. Differential bearing preload and drive gear backlash is adjusted by nuts located behind each differential bearing cup.

The drive pinion assembly is mounted on two opposed tapered roller bearings. Pinion bearing preload is adjusted by a collapsible spacer on the pinion shaft. Pinion and ring gear tooth contact is adjusted by shims between the rear bearing cone and pinion gear.

A cover on the rear of the differential housing provides access for inspection and the removal and installation of the differential assembly and drive pinion.

Removable Carrier Type Axle

The rear axle is of the banjo-housing, hypoid gear type, in which the centerline of the pinion is mounted below the centerline of the ring gear (Fig. 2).

The pinion gear and the pinion bearings are assembled in a pinion retainer, which is bolted to the carrier. In this axle, the pinion is straddle mounted; that is, the pinion is supported by bearings both in front of and to the rear of the pinion gear. Two opposed tapered roller bearings support the pinion shaft in front of the pinion gear. A straight roller (pilot) bearing supports the pinion shaft at the rear of the pinion gear. Pinion and ring gear tooth contact is adjusted by shims between the pinion retainer and the carrier housing.

The differential assembly is mounted on two opposed tapered roller bearings, which are retained in the carrier by removable caps. The entire carrier assembly is bolted to the axle housing.

Ball bearing assemblies (rear

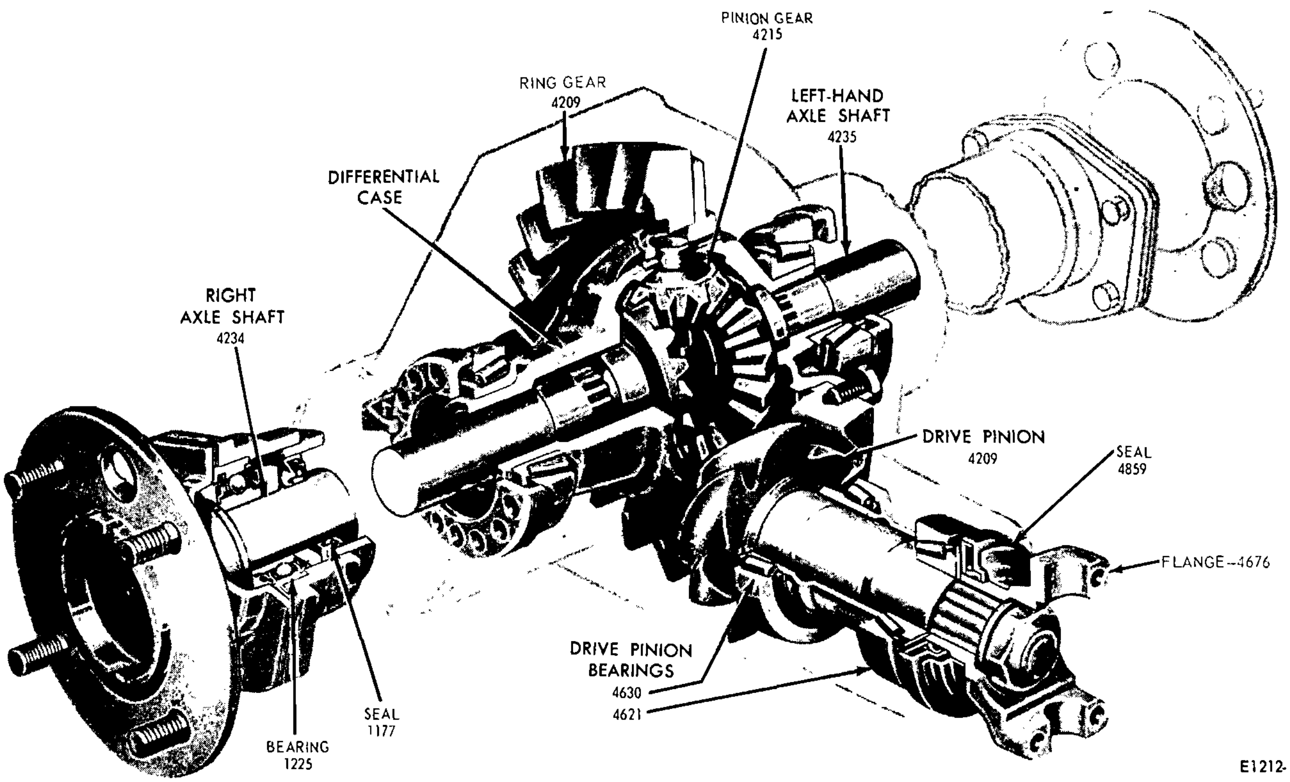


FIG. 1—Typical Rear Axle Assembly—Integral Carrier Type Axle

wheel bearings) are pressed onto the outer ends of the axle shafts and set in the outer ends of the axle housing. These bearings support the semi-floating axle shafts at the outer ends. The inner ends of the shafts spline to the differential side gears. Bearing retainer plates hold the shafts in the housing. The left and right axle shafts are not interchangeable, because the left axle shaft is shorter than the right.

OPERATION

The rear axle drive pinion receives its power from the engine through the transmission and drive shaft. The pinion gear rotates the differential case through engagement with the ring gear, which is bolted to the case outer flange. Inside the case, there are two (in some axles 4) differential pinion gears mounted on the differential pinion shaft which is pinned to the case. These pinion gears are engaged with the side gears, to which the axle shafts are splined. Therefore, as the differential case turns, it rotates the axle shafts and rear wheels. When it is necessary for one wheel and axle shaft to rotate faster than the other, the faster turning side gear causes the pinions to roll on the slower turning side gear to allow differential action between the two axle shafts.

LIMITED-SLIP DIFFERENTIAL AXLE

The limited-slip differential is provided as optional equipment in both the integral and the removable carrier type axle.

DESCRIPTION

The axle assembly, except for the differential case and its internal components, is identical to the conventional axle.

A constant-friction limited-slip differential, which employs automatic transmission-type clutch plates to control differential action, is available as optional equipment (Fig. 3).

Four steel clutch plates are locked into the differential cover. Three bronze, bonded clutch plates are splined to a clutch hub which, in turn is splined to the left-hand axle shaft. A Belleville spring washer maintains a constant pressure between the steel and bonded clutch plates so that the clutch is always engaged.

OPERATION

The pressure between clutch plates opposes differential action at all times. When the vehicle turns a corner the clutch slips allowing normal differential action to take place. Under adverse weather conditions, where one or both wheels may be on a low-traction surface such as snow, ice or mud, the friction between the clutch plates will transfer a portion of the usable torque to the wheel with the most traction. Thus, the wheel that is on ice or snow will not spin, but will have a tendency to operate with the opposite wheel in a combined driving effort.

When performing the following procedures, refer to Part 4-1, Section 3 for cleaning and inspection procedures.

CARE OF AXLE

The lubricant level should be checked every 6000 miles, with vehicle in normal curb attitude. The lubricant level should be at the lower edge of the filler plug hole located in either the carrier casting or housing cover. It is unnecessary to periodically drain the axle lubricant. The factory fill should remain in the housing for the life of the vehicle, except when repairs are made. The specified lubricant should be installed when the axle is overhauled.

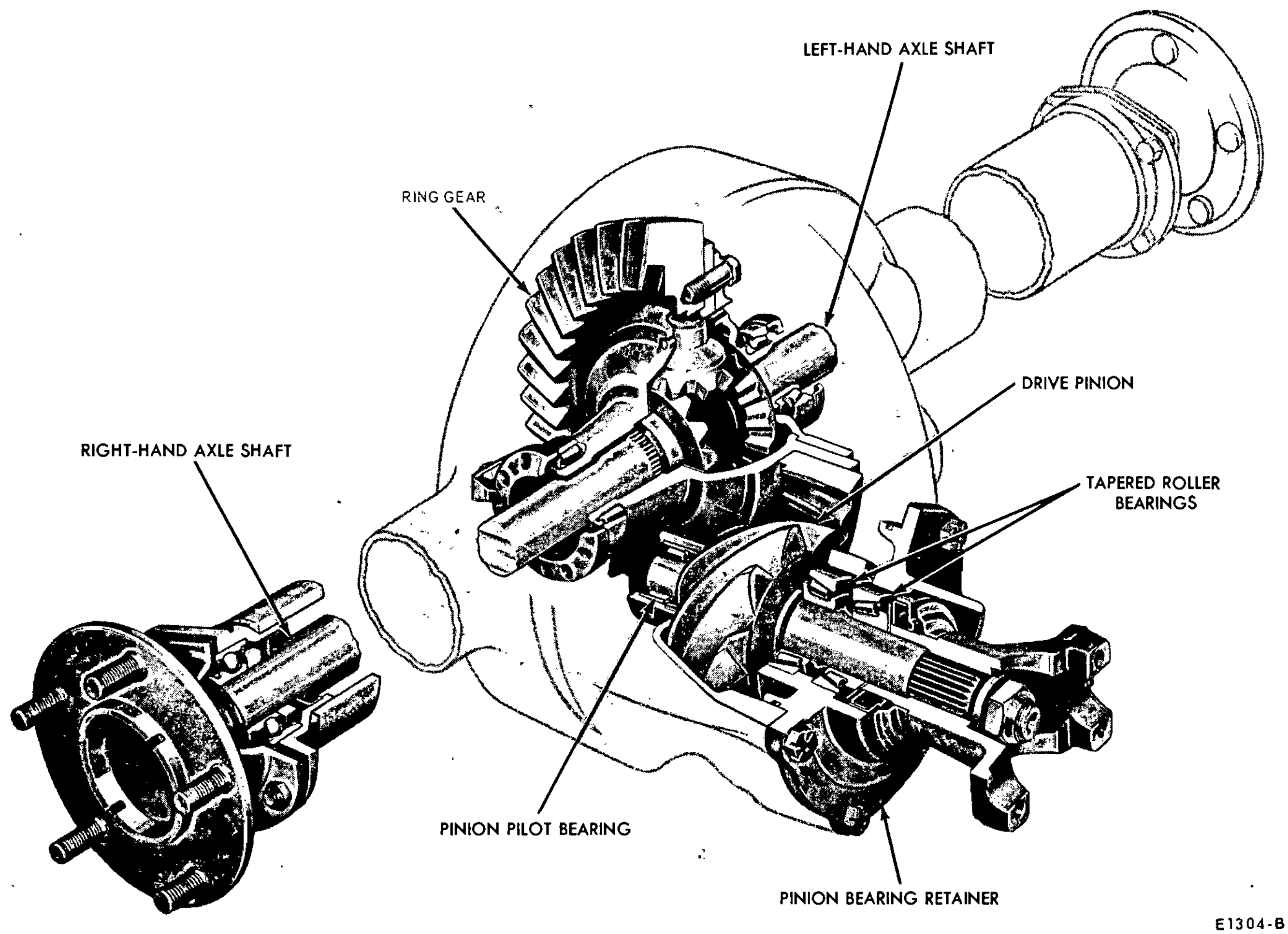


FIG. 2—Rear Axle Assembly—Removable Carrier Type Axle

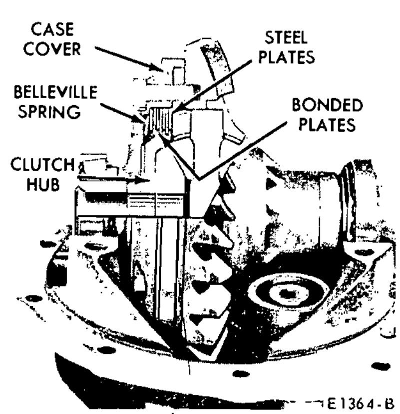


FIG. 3—Typical Limited-Slip Differential

2 IN-VEHICLE ADJUSTMENT AND REPAIR

REAR AXLE SHAFT, WHEEL BEARING AND OIL SEAL REPLACEMENT

Synthetic wheel bearing seals are used for production purposes only. Removal and insertion of rear axle shafts must be performed with caution. The entire length of the shaft (including spline) up to the seal journal must pass through the seal without contact. Any roughing or cutting of the seal element during axle removal or installation will result in early seal failure. Leather seals only will be used as service replacements for synthetic wheel bearing seals.

The rear axle shafts, wheel bearings, and oil seal can be replaced

without removing the differential assembly from the axle housing. **Removal of the wheel bearings from the axle shafts make them unfit for further use.**

1. Remove the wheel cover, wheel and tire from the brake drum.

2. Remove the Tinnerman nuts that secure the brake drum to the axle housing flange, and then remove the drum from the flange.

3. Working through the hole provided in each axle shaft flange, remove the nuts that secure the wheel bearing retainer plate. Then pull the axle shaft assembly out of the axle housing (Fig. 4 or 5). **The brake backing plate must not be dislodged. Install one nut to hold the plate in place after the axle shaft is removed.**

4. If the rear wheel bearing is to be replaced, loosen the inner retainer ring by nicking it deeply with a cold chisel in several places (Fig. 6). It will then slide off easily.

5. Remove the bearing from the axle shaft with the tool shown in Fig. 7 or 8. If the push-puller operation shown in Fig. 8 is used, be sure that the puller arms contact **the flat surface** of the axle shaft flange rather than the bolt heads. Also with this method, be careful not to damage or burr the oil seal journal as the bearing breaks loose.

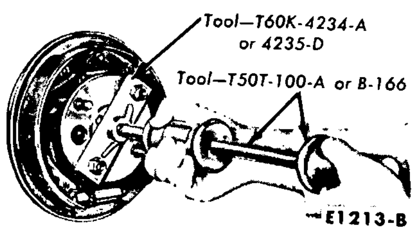


FIG. 4—Removing Axle Shaft—Integral Carrier Type Axle

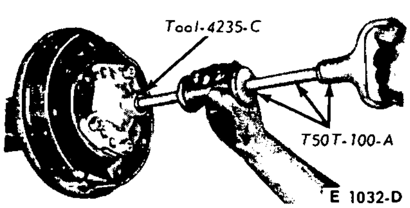


FIG. 5—Removing Axle Shaft—Removable Carrier Type Axle

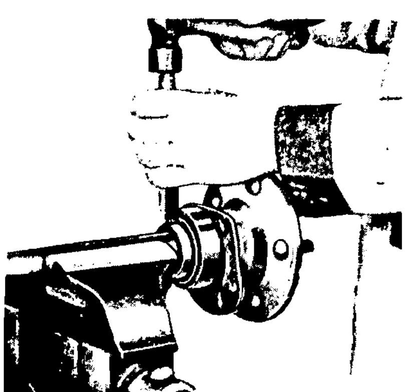


FIG. 6—Removing Rear Wheel Bearing Retainer Ring

6. **Whenever a rear axle shaft is replaced the oil seal must be replaced.** Remove the seal with the tools shown in Fig. 9. Soak new oil seals in SAE 10 oil for 1/2 hour before installing.

7. Inspect the machined surface of the axle shaft and the axle housing for rough spots or other irregularities which would affect the sealing action of the oil seal. Check the axle shaft splines for burrs, wear or damage. Carefully remove any burrs or rough spots. Replace worn or damaged parts.

8. Lightly coat wheel bearing bores with axle lubricant.

9. Place the retainer plate on the axle shaft, and press the new wheel bearing on the shaft with the tool shown in Fig. 7 or 8. **The bearing should seat firmly against the shaft shoulder. Do not attempt to press on both the bearing and the inner retainer ring at the same time.**

10. Using the bearing installation tool, press the bearing inner retainer ring on the shaft until the retainer seats firmly against the bearing.

11. Wipe all lubricant from the inside of the axle housing in the area of the oil seal before installing the new seal.

12. Wipe a small amount of oil resistant sealer on the outer edge of the seal before it is installed. **Do not put sealer on the sealing lip.**

13. **Rear wheel oil seals with synthetic sealing elements have been incorporated in production. However, only leather seals will be used as replacements for the synthetic sealing element seals.** Install the new oil seal with the tools shown in Fig. 9. **Installation without use of the proper tool will distort the seal and cause leakage. Be sure the new seal has been soaked in SAE 10 oil for 1/2 hour.**

14. Place a new gasket on each side of the brake backing plate, and then carefully slide the axle shaft into the housing so that the rough forging of the shaft will not damage the oil seal. Start the axle splines into the side gear, and push the shaft in until the bearing bottoms in the housing.

15. Install the bearing retainer plate on the mounting bolts at the axle housing, and install the attaching nuts. Torque the nuts to specifications.

16. Install the brake drum and the drum retaining nuts.

17. Install the wheel and tire on the drum, and install the wheel cover.

REMOVAL AND REPLACEMENT OF DRIVE PINION OIL SEAL

Synthetic seals must not be cleaned, soaked or washed in cleaning solvent.

Replacement of the pinion oil seal on either type axle involves removal and installation of only the pinion shaft nut and the universal joint flange. **However, this operation disturbs the pinion bearing preload, and this preload must be carefully reset when assembling.**

1. Raise the vehicle and install safety stands. Remove the rear wheels and brake drums.

2. Make scribe marks on the drive shaft end yoke and the axle U-joint

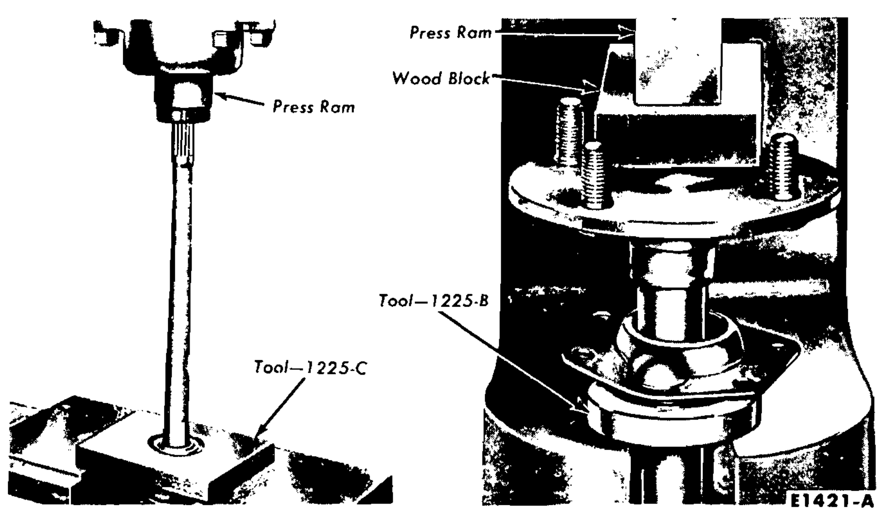


FIG. 7—Removing and Installing Rear Wheel Bearing—Comet

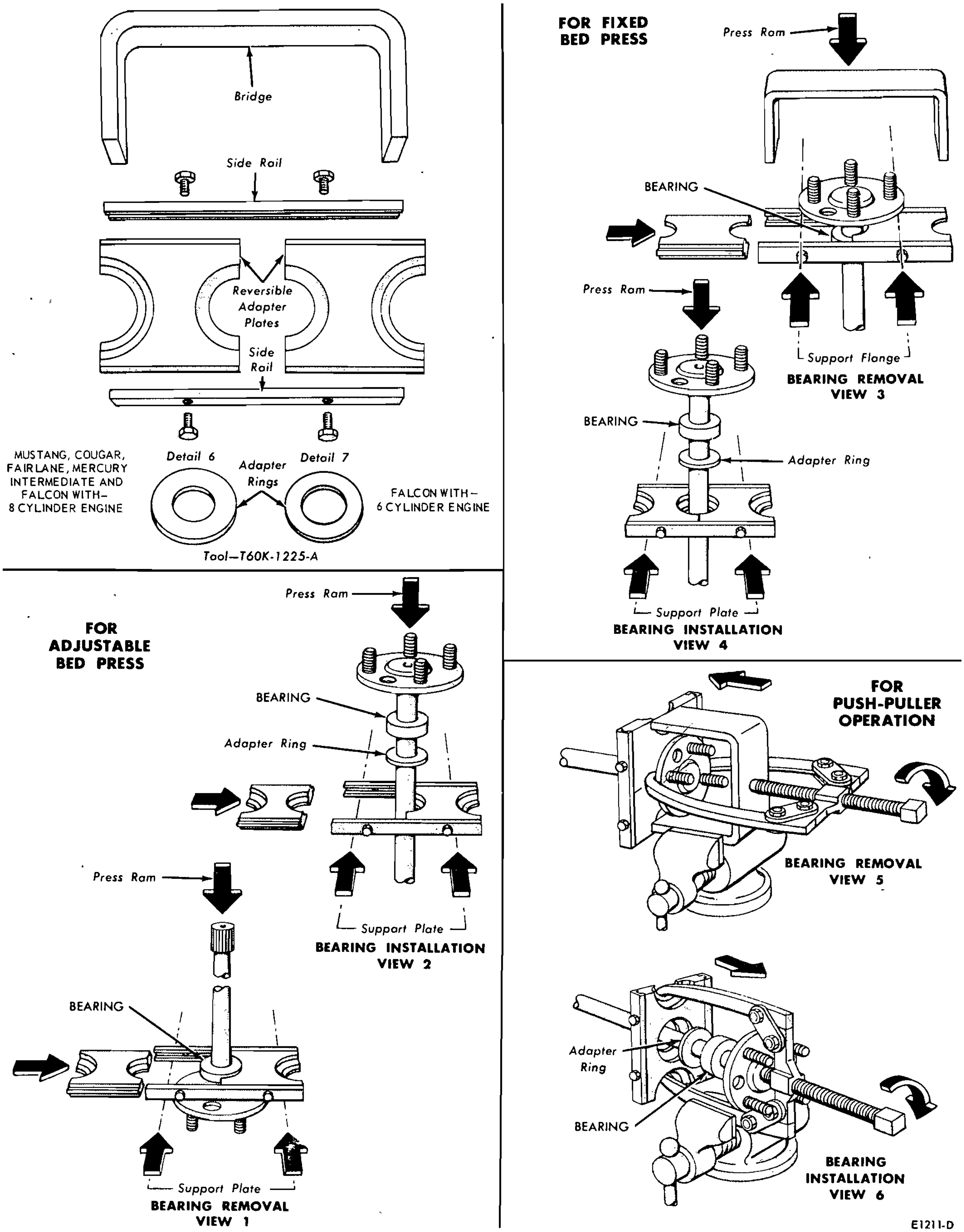


FIG. 8—Removing and Installing Rear Wheel Bearing—Falcon, Mustang and Fairlane

flange to insure proper position of the drive shaft at assembly (Fig. 14). Disconnect the drive shaft from the axle U-joint flange. **Be careful to avoid dropping the loose universal joint bearing cups.** Hold the cups on the spider with tape. Mark the cups so that they will be in their original position in relation to the flange when they are assembled. Remove the drive shaft from the transmission extension housing. Install an oil seal replacer tool in the transmission extension housing to prevent transmission leakage. Refer to the transmission group for the appropriate tool.

3. Install an in-lb torque wrench on the pinion nut. Record the torque required to maintain rotation of the pinion shaft through several revolutions.

4. While holding the flange with the tool shown in Fig. 10, remove the integral pinion nut and washer.

5. Clean the pinion bearing retainer around the oil seal. Place a drain pan under the seal, or raise the front of the vehicle higher than the rear.

6. Using the tool shown in Fig. 11, remove the pinion U-joint flange.

7. Using the tool shown in Fig. 37, remove the drive pinion oil seal.

8. Clean the oil seal seat.

9. Pinion oil seals have pre-applied oil resistant sealer. Install the seal in the retainer, using the tool shown in Fig. 12 on integral carrier type axles. With removable carrier type axles, use tool T62F-4676-A or 4676-H on all except vehicles equipped with high performance engines. On vehicles equipped with high performance engines, use tool 58L-4676-A or 4676-F.

10. Check splines on the pinion shaft to be sure they are free of burrs. If burrs are evident, remove them by using a fine crocus cloth, working in a rotational motion. Wipe the pinion shaft clean.

11. Apply a small amount of lubricant to the U-joint splines.

12. Align the punch mark on the U-joint flange with the mark on the end of the pinion shaft, and install the flange. With removable carrier type axles, it will be necessary to use the tool shown in Fig. 49 to install the flange.

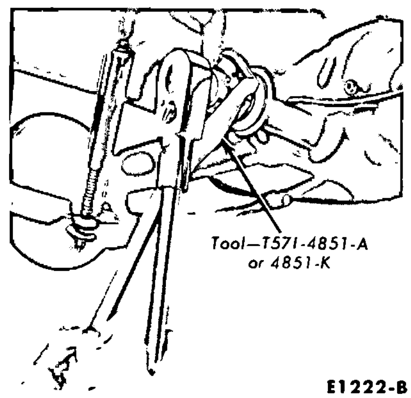


FIG. 10—Typical Drive Pinion Shaft Nut Removal

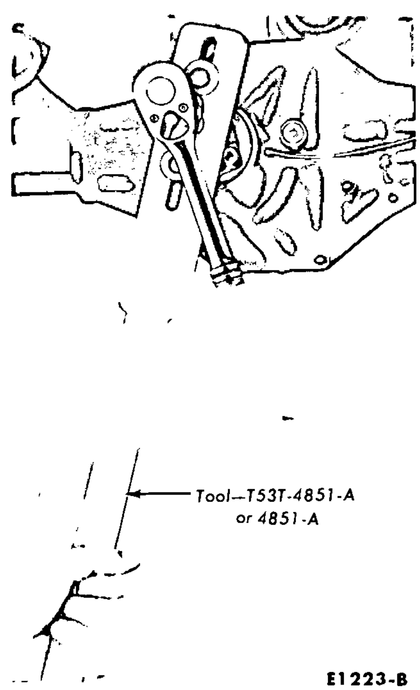


FIG. 11—Typical Drive Pinion Flange Removal

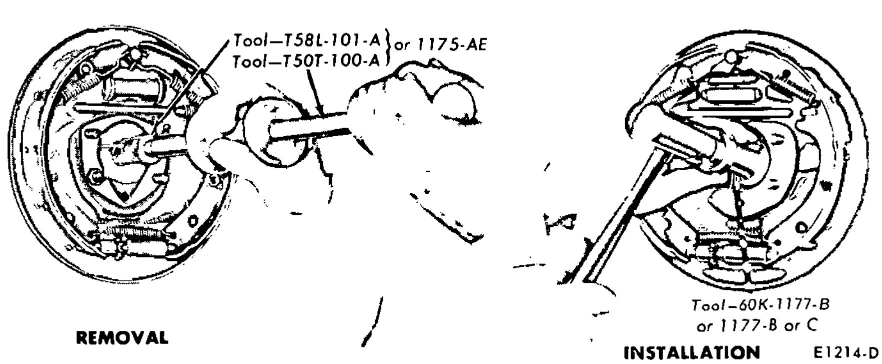


FIG. 9—Removing and Installing Axle Shaft Seal

13. Install a new integral nut and washer on the pinion shaft. (Apply a small amount of lubricant on the washer side of the nut.)

14. Hold the flange with the tool shown in Fig. 36 while tightening the nut.

15. Tighten the pinion shaft nut, rotating the pinion occasionally to insure proper bearing seating, and take frequent preload readings until the preload is at the original recorded reading established in step 3.

16. After original preload has been reached, tighten the pinion nut slowly, until an additional preload has been placed on the bearings, as shown below:

Removable Carrier: 8 to 14 in-lbs.
Integral Carrier: 6 to 12 in-lbs.

The preload should not exceed the amount indicated above, or bearing failure may result. Under no circumstances should the pinion nut be backed-off to lessen preload. If this is done, a new pinion bearing spacer must be installed. In addition, the U-joint flange must never be hammered on, or power tools used.

17. Remove the oil seal replacer tool from the transmission extension housing. Install the front end of the drive shaft on the transmission output shaft.

18. Connect the rear end of the drive shaft to the axle U-joint flange, aligning the punch marks made on the drive shaft end yoke and the axle U-joint flange (Fig. 14).

19. Check the lubricant level. Make sure the axle is in running position. Add whatever amount of specified lubricant is required to reach the lower edge of the filler plug hole, located in the carrier casting or the housing cover.

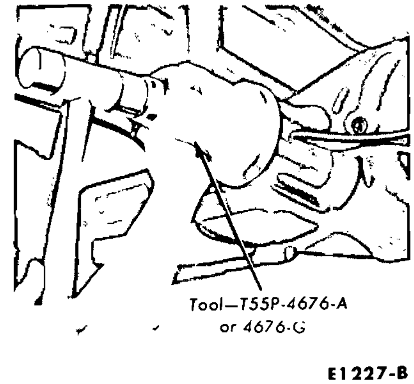


FIG. 12—Typical Drive Pinion Flange Seal Installation

REMOVAL AND INSTALLATION OF THE ORIGINAL U-JOINT FLANGE

Use procedure as outlined under drive pinion oil seal replacement.

INSTALLATION OF A NEW UNIVERSAL JOINT FLANGE (IN VEHICLE)

1. Raise the vehicle and install safety stands. Remove both rear wheels and brake drums.
2. Disconnect the drive shaft from the axle U-joint flange. **Be careful to avoid dropping the loose universal joint bearing cups. Hold the cups on the spider with tape.** Mark the cups so that they will be in their original position in relation to the flange when they are assembled. Remove the drive shaft from the transmission extension housing. Install an oil seal replacer tool in the transmisssion extension housing to prevent transmission fluid leakage. Refer to the transmission group for the appropriate tool.
3. Install an in-lb torque wrench on the pinion nut. Record the torque required to maintain rotation of the pinion shaft through several revolutions.
4. While holding the flange with the tool shown in Fig. 36, remove the integral pinion nut and washer.
5. Clean the pinion bearing retainer around the oil seal. Place a drain pan under the seal, or raise the front of the vehicle higher than the rear. **Synthetic seals must not be cleaned, soaked or washed in cleaning solvents.**
6. Using the tool shown in Fig. 36, remove the U-joint flange.
7. Check splines on the pinion shaft to be sure they are free of burrs. If burrs are evident, remove them by using a fine crocus cloth, working in rotational motion, then wipe clean.

Apply a small amount of lubricant to U-joint splines.

8. Install the U-joint flange using the tool shown in Fig. 49.
9. Install a new integral nut and washer on the pinion shaft. (Apply a small amount of lubricant on the washer side of the nut.)
10. Hold the flange with the tool shown in Fig. 35 while the nut is being tightened.
11. Tighten the pinion shaft nut, rotating the pinion occasionally to insure proper bearing seating, and take frequent preload readings until the preload is at the original recorded reading established in step 3.
12. After original preload has been reached, tighten the pinion nut slowly, until an additional preload has been reached as shown below:

Removable Carrier: 8 to 15 In. Lbs.
Integral Carrier: 6 to 12 In. Lbs.
The preload should not exceed the amount shown above, or bearing failure may result.

Under no circumstances should the pinion nut be backed off to lessen preload. If this is done, a new pinion bearing spacer must be installed. (In addition, the U-joint flange must never be hammered on, or pneumatic tools used.)

13. Remove the oil seal replacer tool from the transmission extension housing. Install the front end of the drive shaft on the transmission output shaft.
14. Connect the rear end of the drive shaft to the axle U-joint flange, aligning the scribe marks made on the drive shaft end yoke and the axle U-joint flange (Fig. 14).
15. Check the lubricant level. **Make sure the axle is in running position.** Add whatever amount of specified lubricant is required to reach the lower edge of the filler plug hole, located in the carrier casting or housing cover.

3 REMOVAL AND INSTALLATION

REAR AXLE HOUSING INTEGRAL CARRIER TYPE AXLE

REMOVAL

1. Raise the vehicle and support it with safety stands under the rear frame member.
2. Drain the lubricant from the axle.
3. Disconnect the drive shaft at the drive pinion flange.
4. Disconnect the lower end of the shock absorbers.
5. Remove the wheels, brake drums and both axle shafts as outlined in the foregoing Section 2.
6. Remove vent hose front vent tube (Corbin clamp) and remove vent tube from brake tube junction and axle housing.
7. Remove the hydraulic brake T-fitting from the axle housing. **Do not open the hydraulic brake system lines.** Remove the hydraulic brake line from its retaining clip on the axle housing.
8. Remove both axle shaft oil seals with the tools shown in Fig. 9.
9. Remove both brake backing plates from the axle housing and suspend them above the housing with mechanic's wire. The hydraulic brake lines and the parking brake cables are still attached to the brake carrier plates.
10. Support the rear axle housing on a jack, and then remove the spring clip nuts. Remove the spring clip plates (Fig. 13).
11. Lower the axle housing and remove it from under the vehicle.
12. If the axle housing is being replaced, transfer all the differential and pinion parts to the new housing.

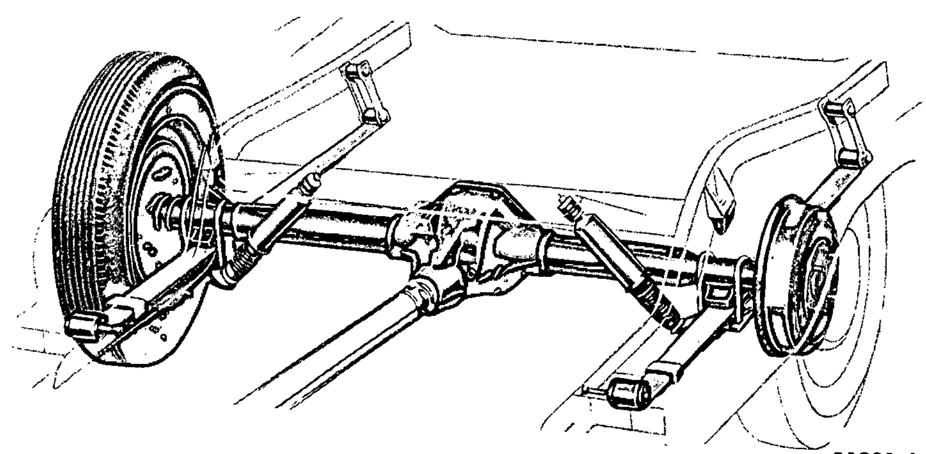


FIG. 13—Rear Axle Installation—Integral Carrier Type

See Section 4, Major Repair Operations.

INSTALLATION

1. Raise the axle housing into position so that the spring clip plates can be installed. On a Comet or Fairlane position the spring upper insulators and retainers between the axle housing and springs and install the lower insulators. Torque the spring clip nuts to specification.
2. Place the brake backing plates in their normal position on the axle housing. Use new gaskets on each side of the brake backing plates.
3. Install new axle shaft oil seals with the tool shown in Fig. 9. Soak the new seals in light weight engine oil (SAE 10) for 1/2 hour before installing them. **Installation without use of the proper tool will distort the seal and cause leakage.** Coat the outside edges of the new oil seal with a hardening type of sealer such as Permatex No. 2 or its equivalent.
4. Install the axle shafts, brake drums and wheels as outlined in the foregoing Section 2.
5. Attach the hydraulic brake line T fitting to the axle housing, and secure the hydraulic brake line in its retainer on the axle housing.
6. Install vent tube to brake tube junction and install vent hose to vent tube.
7. Raise the axle housing and connect the shock absorbers.
8. Connect the drive shaft at the drive pinion flange.
9. Fill the axle with the proper grade and amount of lubricant.
10. Road test the vehicle.

DIFFERENTIAL CARRIER—REMOVABLE CARRIER TYPE AXLE

REMOVAL

1. Raise the vehicle on a hoist and remove the two rear wheel and tire assemblies.
2. Remove the two brake drums (3 Tinnerman nuts at each drum) from the axle shaft flange studs. If difficulty is experienced in removing the drums, back off the brake shoes as explained in Part 2-2.
3. Working through the hole provided in each axle shaft flange, remove the nuts that secure the rear wheel bearing retainer plate. Pull each axle shaft assembly out of the axle housing (Fig. 5). **Care must be exercised to prevent damage to the production-type synthetic oil seal, if so equipped. Any roughing or cutting of the seal element during removal or installation can result in early seal failure.** Install a nut on one of the brake backing plate retaining bolts to hold the plate to the axle housing after the shaft has been removed.
4. Make scribe marks on the drive shaft end yoke and the axle U-joint flange to insure proper position at assembly. Disconnect the drive shaft at the rear axle U-joint, remove the drive shaft from the transmission extension housing. Install an oil seal replacer tool in the housing to prevent transmission leakage. Refer to the transmission group for the appropriate tool.
5. Place a drain pan under the carrier and housing, remove the carrier retaining nuts, and drain the axle. Remove the carrier assembly from the axle housing.

INSTALLATION

Synthetic, production-type wheel bearing seals must not be cleaned, soaked or washed in cleaning solvent.

1. Clean the axle housing and shafts using kerosene and swabs. To avoid contamination of the grease in the sealed ball bearings, do not allow any quantity of solvent directly on the wheel bearings. Clean the mating surfaces of the axle housing and carrier.
2. Position the differential carrier on the studs in the axle housing using a new gasket between carrier and housing. Install the copper washers and the carrier-to-housing retaining nuts, and torque to specifications.
3. Remove the oil seal replacer tool from the transmission extension housing. Position the drive shaft so that the front U-joint slip yoke splines to the transmission output shaft.
4. Connect the drive shaft to the axle U-joint flange, aligning the scribe marks made on the drive shaft end yoke and the axle U-joint flange during the removal procedure (Fig. 14). Install the U-bolts and nuts and torque to specifications.
5. Install the two axle shaft assemblies in the axle housing. **Care must be exercised to prevent damage to the oil seals.** The shorter shaft goes into the left side of the housing.

When installing an axle shaft, place a new gasket on each side of the brake backing plate and carefully slide the axle shaft into the housing so that the rough forging of the shaft will not damage the oil seal. Start the axle splines into the differential side gear, and push the shaft in until the bearing bottoms in the housing.

6. Install the bearing retainers on the attaching bolts on the axle housing flanges. Install the nuts on the bolts and torque to specifications.
7. Install the two rear brake drums and the drum retaining (Tinnerman) nuts.
8. Install the rear wheel and tire assemblies.
9. If the rear brake shoe were backed off, adjust the brakes as outlined in Part 2-1.
10. Fill the rear axle with specified lubricant.

AXLE HOUSING—REMOVABLE CARRIER TYPE AXLE

REMOVAL

1. Remove the carrier assembly from the axle housing as outlined in the foregoing procedure.
2. Position safety stands under the frame rear members, and support the axle housing with either a floor jack or hoist.
3. Disengage the brake line from the clips that retain the line to the axle housing.
4. Disconnect the vent tube from the rear axle housing.
5. Remove the brake backing plate assemblies from the axle housing, and support them with wire. Do not disconnect the brake line.
6. Disconnect each rear shock absorber from the spring clip plate and position out of the way.
7. Lower the rear axle slightly to reduce some of the spring tension. At each rear spring, remove the spring clip (U-bolt) nuts, spring clips, and spring clip plate. Remove the spring lower insulator and retainer. See Part 3-2.
8. Remove the rear axle housing from under the vehicle.

INSTALLATION

1. Position the rear axle housing on the rear springs. On a Comet or Fairlane, position the spring upper insulators and retainers between the axle housing and springs, and install the lower insulators.
2. Install the spring clips (U-bolts), spring clip plate, and nuts. **Torque the spring clip nuts evenly to specifications.**
3. If a new axle housing is being installed, remove the bolts that retain the brake backing plate and bearing retainer from the old housing flanges. Position the bolts in the new housing flanges to hold the brake carrier plates in position. Install the carrier plates with new gaskets to the axle housing flanges.
4. Connect the vent tube to the axle housing.

5. Position the brake line to the axle housing, and secure with the retaining clips.

6. Raise the rear axle housing and springs enough to allow connecting the rear shock absorbers to the spring clip plates. Connect the lower stud of each shock absorber to its spring clip plate, and install the bushing, washer, and nut on the stud. **Be sure the spring clip plate is free of burrs. Tighten the nut to specified torque.**

7. **Rear wheel oil seals with synthetic sealing elements have been incorporated in production. However, only leather seals will be used as replacements for the synthetic sealing element seals.**

Soak two new rear wheel bearing oil seals in SAE 10 oil for 1/2 hour before installation. Supply a small amount of an oil resistant sealer on the outer edge of each seal before it is installed. **Do not put any of the sealer on the sealing lip.** Install the oil seals in the ends of the rear axle housing with the tool shown in Fig. 9.

Install the carrier assembly and the two axle shaft assemblies in the axle housing as outlined in the Installation procedure under Differential Carrier—Removable Carrier Type Axle.

Care must be exercised to prevent damage to the oil seals.

4 MAJOR REPAIR OPERATIONS—INTEGRAL CARRIER TYPE AXLE

DISASSEMBLY

All service operations on the differential case assembly and the drive pinion assembly can be performed with the housing in the vehicle.

REMOVAL OF DIFFERENTIAL CASE AND DRIVE PINION

1. Raise the vehicle and support it on the underbody, so that the rear axle drops down as far as the springs and shock absorbers permit.
2. Remove the cover from the carrier casting rear face, and drain the lubricant.
3. Perform the Inspection Before Disassembly of Carrier in Part 4-1, Section 3.
4. Remove both rear wheels.
5. Remove the brake drums.
6. Working through the hole provided in the axle shaft flange, remove the nuts that attach the wheel bearing retainers to the axle housing.
7. Pull the axle shafts with the tool shown in Fig. 4. **Care must be exercised to prevent damage to the oil seals.** Install a nut on one of the brake carrier plate attaching bolts to hold the plate to the axle housing after the shaft has been removed. Remove both seals with the tool shown in Fig. 9.
8. Make scribe marks on the drive shaft end yoke and the axle U-joint flange to insure proper position of the drive shaft at assembly (Fig. 14). Disconnect the drive shaft from the axle U-joint flange. **Be careful to avoid dropping the loose universal joint bearing cups.** Hold the cups on the spider with tape. Mark the cups so that they will be in their original position in relation to the flange when they are assembled. Remove the drive shaft from the transmission extension housing. Install an oil seal replacer tool in the transmission extension housing to prevent transmission leakage. Refer to the transmission group for the appropriate tool.

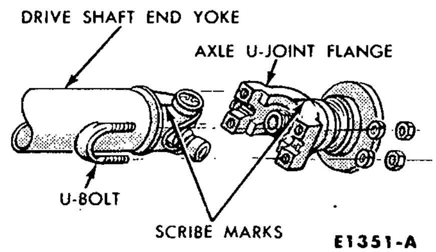


FIG. 14—Drive Shaft-to-Axle U-Joint Connection

9. Remove the differential bearing adjusting nut locks (Fig. 15).
10. Mark one differential bearing cap and the case (Fig. 16) to help position the parts properly during assembly.
11. Remove the differential bearing cap bolts and bearing caps. **Hold the differential case assembly in the housing after the caps are removed.**
12. Remove the differential case and bearing cups (Fig. 17).
13. Hold the drive pinion flange and remove the pinion nut (Fig. 10).
14. Remove the pinion flange (Fig. 11).
15. With a soft-faced hammer, drive the pinion out of the front bearing cone and remove it through the rear of the carrier casting.
16. Drive against the pinion front bearing cone, and drive the pinion flange seal and the bearing cone out of the front of the carrier casting.
17. To remove and install the pinion rear bearing cone use the tools in Fig. 18.
18. Measure the shim which is found under the bearing cone with a micrometer. Record the thickness of the shim.

DISASSEMBLY OF CONVENTIONAL DIFFERENTIAL CASE

1. If the differential bearings are to be removed, use the tools shown in Fig. 19.
2. Remove the bolts that attach the ring gear to the differential case. Press the ring gear from the case or tape it off with a soft-faced hammer.
3. With a drift, drive out the differential pinion shaft lock pin (Fig. 20).
4. Drive out the pinion shaft with a brass drift. Remove the gears and thrust washers.

DISASSEMBLY OF LIMITED-SLIP DIFFERENTIAL CASE

1. Place the differential case in a hydraulic press, and apply about one ton pressure across the case bearing hubs while removing the drive gear attaching bolts. This procedure will contain the spring pressure between the differential case and cover until after the bolts are removed, and thereby prevent stripping of the threads.
2. Release the hydraulic press ram, and remove the differential case cover.
3. Remove the Belleville spring (Fig. 21).
4. Remove the steel and the bonded clutch plates.
5. Remove the differential clutch hub, outer side gear, and thrust washer.
6. Remove the ring gear from the differential case.
7. Drive out the differential pinion shaft lock pin.
8. With a brass drift, drive out the differential pinion shaft. Then remove the pinion gears, inner side gear and thrust washers.

PARTS REPAIR OR REPLACEMENT

Clean and inspect all the parts as outlined in Part 4-1, Section 3. Before assembling the carrier, repair or replace all parts as indicated by the inspection.

The principal replacement operations are covered in the following

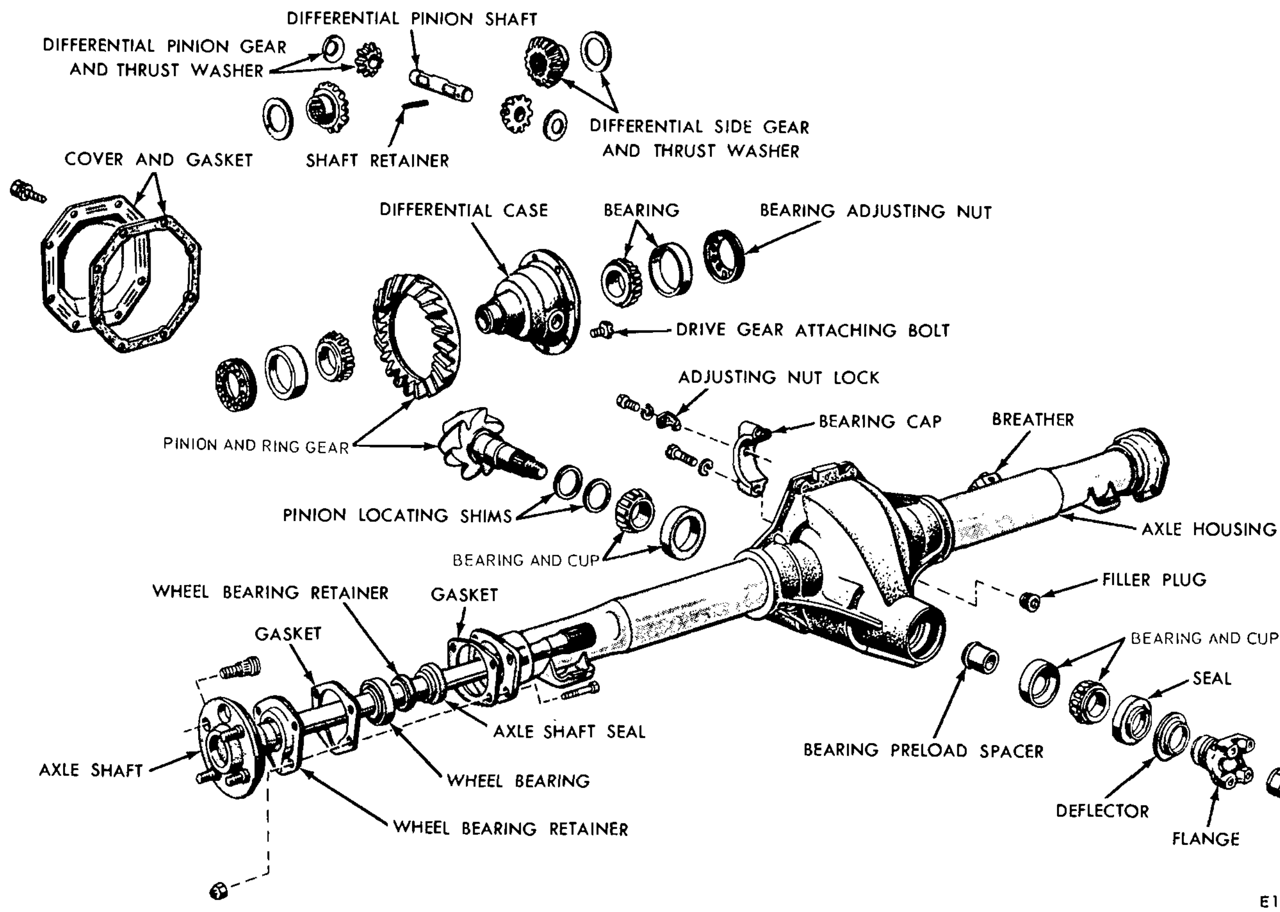


FIG. 15—Disassembled Rear Axle

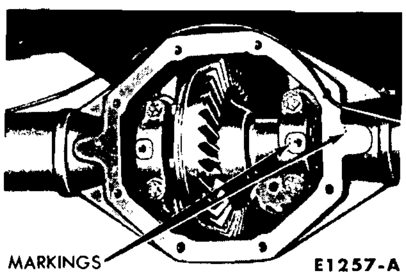


FIG. 16—Typical Differential Bearing Cap Marking

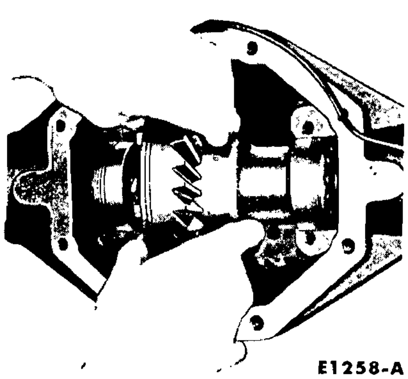


FIG. 17—Differential Case Removal or Installation

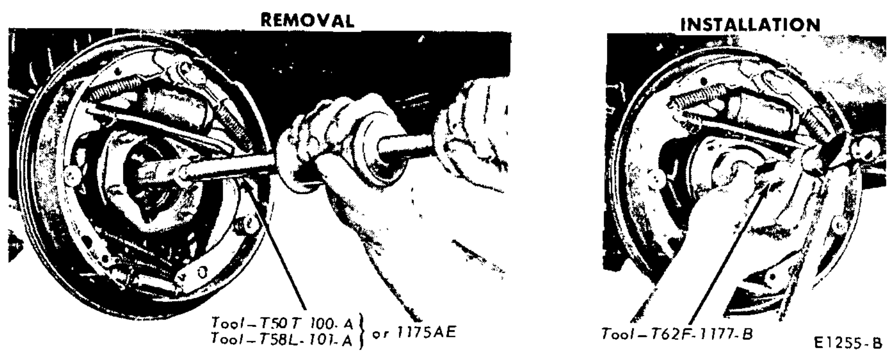


FIG. 18—Pinion Rear Bearing Cone Removal and Installation

procedures. All other repair or replacement operations are performed during Cleaning and Inspection Part 4-1, Section 3, or during the Assembly in this section.

PINION BEARING CUPS

Do not remove the pinion bearing cups from the carrier casting unless the cups are worn or damaged.

If the pinion bearing cups are to be replaced, drive them out of the carrier casting with a drift. Install the new cups with the tool shown in Fig. 22. Make sure the cups are properly seated in their bores. If a 0.0015-inch feeler gauge can be inserted between a cup and the bottom of its bore at any point around the cup, the cup is not properly seated.

Whenever the cups are replaced, the cone and roller assemblies should also be replaced.

DRIVE PINION AND GEAR SET

Individual differences in machin-

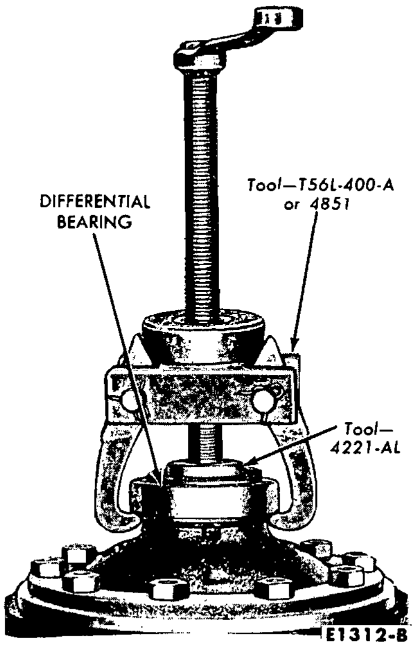


FIG. 19—Differential Bearing Removal

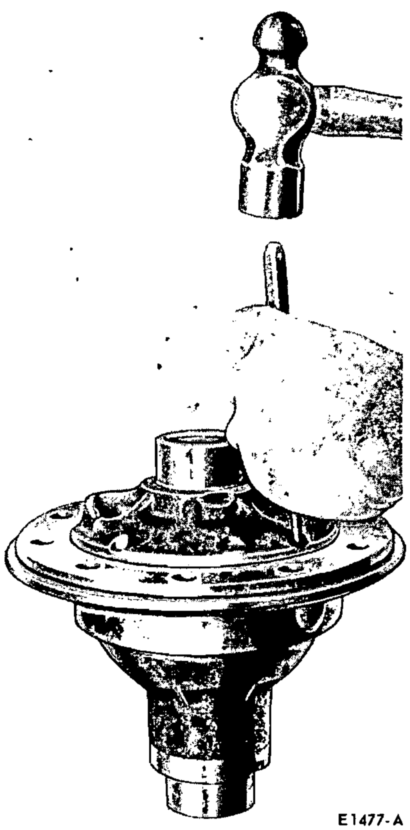


FIG. 20—Differential Pinion Shaft Lock Pin Removal

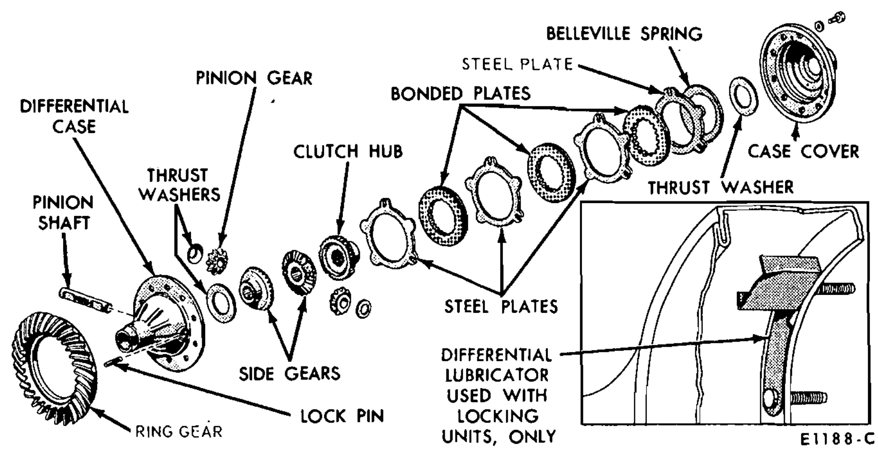


FIG. 21—Locking Differential Assembly

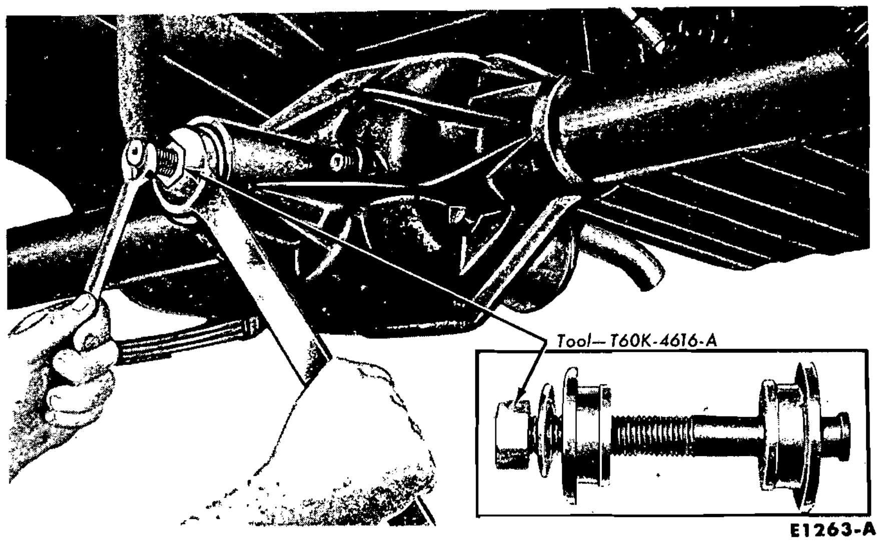


FIG. 22—Pinion Bearing Cup Removal or Installation

ing the carrier casting and the gear set require a shim between the pinion rear bearing cone and the pinion gear to locate the pinion for correct tooth contact with the ring gear.

When replacing a ring gear and pinion it should be noted that the **original** factory installed shim is of the correct thickness to adjust for individual variations in **both** the carrier casting dimension and in the original gear set dimension; therefore, to select the correct shim thickness for the new gear set to be installed, follow these steps:

1. With a micrometer, measure the thickness of the original shim removed from the axle and use the same thickness upon installation of the replacement carrier assembly or drive pinion.

2. If further shim change is necessary, it will be indicated in the tooth pattern check.

3. If the original shim is lost, substitute a nominal shim for the original and use the tooth pattern check to determine if further shim changes are required. Nominal shim thickness is indicated in Part 4-3, Specifications.

A new ring gear and pinion should always be installed in an axle as a matched set (never separately). Be sure the same identifying (matching) number, painted in white, appears on the bolt hole face of the ring gear and on the head of the drive pinion (Fig. 23).

4. After determining the correct shim thickness as explained in the foregoing steps, install the new pinion and ring gear as outlined under Assembly.

DIFFERENTIAL CASE, BEARINGS, AND DRIVE GEAR

If the ring gear runout check (before disassembly) exceeded specifications, the condition may be caused by a warped gear, a defective case, or excessively worn differential bearings.

To determine the cause of excessive runout proceed as follows:

1. Assemble the two halves of the differential case together **without** the ring gear, and press the two differential side bearings on the case hubs.

2. Place the cups on the bearings and set the differential case in the carrier.

3. Install the bearing caps and adjusting nuts as outlined in steps 11 thru 14 under Installation of Drive Pinion and Differential Case in this section.

4. Tighten the right nut two notches beyond the position where it first contacts the bearing cup. Rotate the differential case several revolutions in each direction while the bearings are loaded to seat the bearings in their cups. **This step is important.**

5. Again loosen the right nut to release the preload. Check to see that the left nut contacts the bearing cup. Using the dial indicator set-up shown in Fig. 18. Part 4-1, adjust the preload to 0.008 to 0.012 case spread for new bearings or 0.005 to 0.008 for the original bearings, if reused.

6. Check the runout of the differential case flange with a dial indicator. If the runout does **not now** exceed specifications, install a new ring gear. If the runout still exceeds specifications, the ring gear is true and the trouble is due to either a defective case or worn bearings.

7. Remove the differential case from the carrier and remove the side bearings from the case.

8. Install **new** bearings on the case hubs, and again install the differential assembly in the carrier **without** the ring gear.

9. Check the case runout again with the new bearings. If the runout is **now** within limits, the old bearings were excessively worn. Use the new bearings for assembly. If the runout is still excessive, the case is defective and should be replaced.

ASSEMBLY

Refer to Part 4-1 for Cleaning and Inspection before starting assembly operations.

ASSEMBLY OF CONVENTIONAL DIFFERENTIAL CASE

1. Lubricate all the differential parts with axle lubricant, before they are installed in the case.

2. Place the side gears and thrust washers in the case.

3. Place the two pinion gears and thrust washers exactly opposite each other in the case openings and in mesh with the side gears.

4. Turn the pinions and thrust washers until the holes in the pinion gears align with the pinion shaft holes in the case.

5. Start the pinion shaft into the differential case. Carefully align the shaft lock pin hole with the pin hole in the case. Drive the shaft into place and install the lock pin (Fig. 20).

6. Place the ring gear on the differential case and install the bolts. Torque the bolts to specification.

7. If the differential bearings have been removed, press them on as shown in Fig. 24.

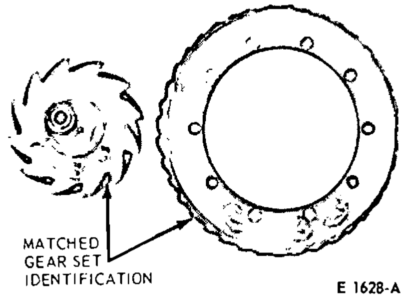


FIG. 23—Pinion and Ring Gear Marking

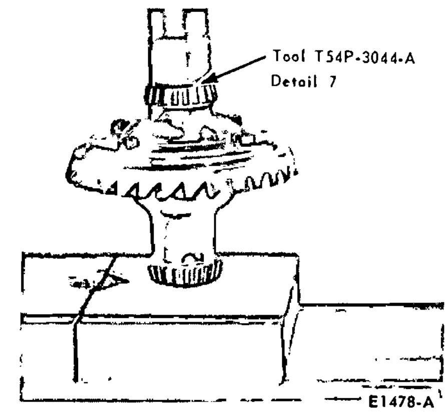


FIG. 24—Differential Bearing Installaton

ASSEMBLY OF LIMITED-SLIP DIFFERENTIAL CASE

1. Place the side gear and thrust washer in the differential case (Fig. 24). **Lubricate all parts liberally with axle lubricant during assembly.**

2. With a soft-faced hammer, drive the pinion shaft into the case only far enough to retain a pinion thrust washer and pinion gear.

3. Place the second pinion and thrust washer in position, and drive the pinion shaft into place. **Carefully line up the pinion shaft lock pin holes.**

4. Install the pinion shaft lock pin. **The lock pin must not extend beyond the surface of the case.**

5. Insert two 2-inch 7/16 (N. F.) bolts through the differential case flange, and thread them three or four turns into the ring gear as a guide in aligning the ring gear bolt holes. Press or tap the drive gear into position.

6. Clamp the differential case in a soft-jawed vise. Install the other differential side gear on the differential pinion gears. Place the clutch hub on the side gear. Place the thrust washer on the hub (Fig. 25).

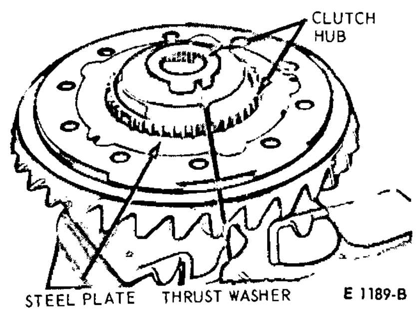


FIG. 25—Installing Steel Clutch Plates and Friction Plates

Clutch Plate Installation

Prior to clutch plate installation, the friction bonded plates must be soaked in C6AZ-19580-C (ESW-M2C104-A) differential lubricant for approximately 1/2 hour. In addition, the differential lubricant must be liberally applied to all components to be assembled.

1. Place the clutch hub into position in a soft-jawed vise.

2. First, install a steel clutch plate in the cavity of the righ hand case and then a bonded friction plate (Fig. 25). **Make sure the bonded friction plate inner-spline teeth properly engage the hub spline.** Install the remaining plates: a steel plate, bonded friction plate, a steel plate, bonded friction plate and lastly a steel plate.

3. Center the Belleville spring on the clutch pack (spring concave-side facing downward on the pack) to prevent trapping the spring between the left and right hand case in an eccentric position (Fig. 26). **Improper location of the Belleville spring will cause extremely high torque and differential chatter. Be sure the slots in**

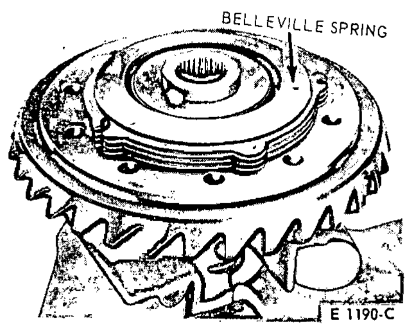


FIG. 26—Belleville Spring Installation

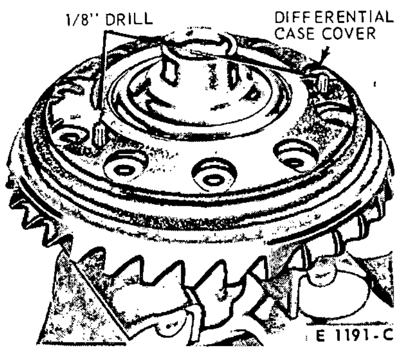


FIG. 27—Differential Cover Installation

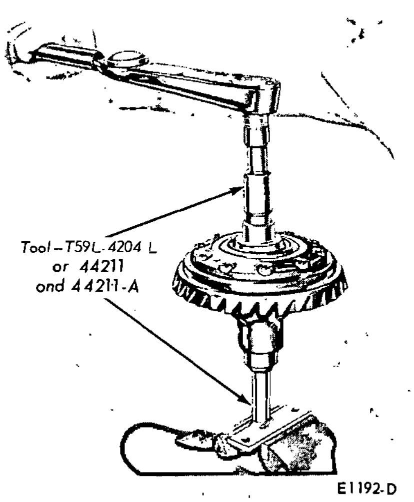


FIG. 28—Differential Torque Check

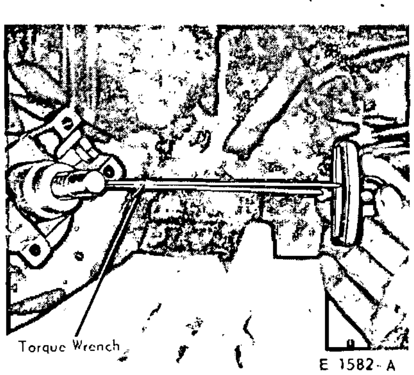


FIG. 29—Checking Pinion Bearing Pre-load

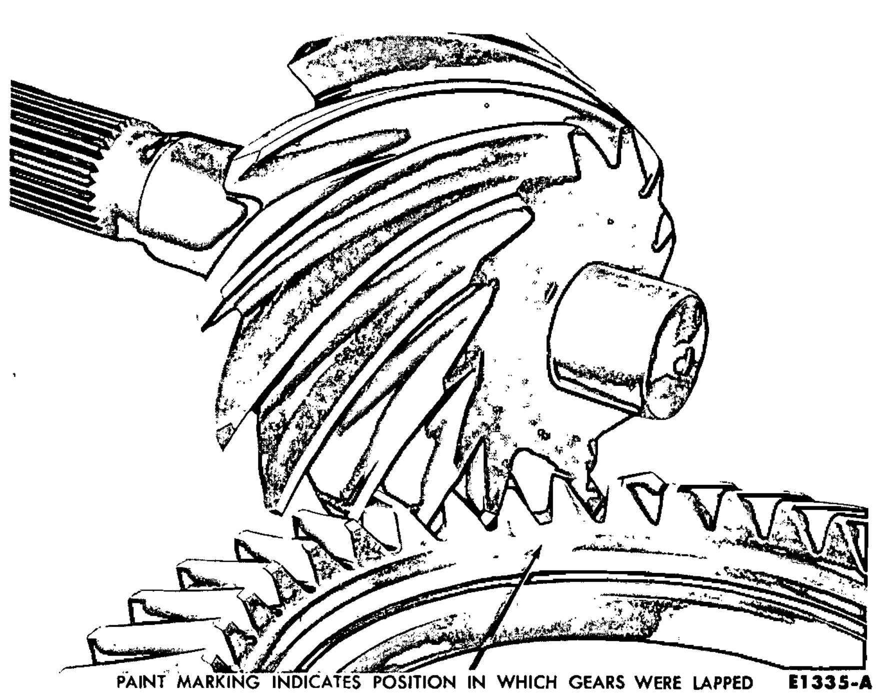


FIG. 30—Typical Gear Set Timing Marks

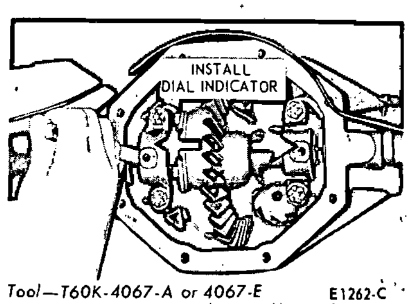


FIG. 31—Backlash and Bearing Pre-load Adjustment

the rabbit ears of the steel plates are in proper alignment.

4. Carefully set the differential case cover over the right hand case (Fig. 27). **At this point, no force or pressure should be applied to the cover. The cover contains two 3/16 inch holes by which the clutch plates can be properly aligned.** Insert the shank ends of two 1/8 inch drill bits into the holes, and work the drill bits back-and-forth until the plates are centered (Fig. 28). When the clutch plates are centered, the weight of the cover will cause it to fall into position. Remove the drill bits.

5. Install the ring gear to differential case bolts, and tighten them evenly and alternately across the diameter of the ring gear. Tighten the bolts to specification.

6. Prior to installation of the limited slip differential into the vehicle, a differential torque check must be made. Check the torque required to rotate one side gear while the other side gear is held. **The initial breakaway torque required to start the side gear turning should be ignored and only the rotating torque required to keep it moving steadily should be recorded.** The torque required to keep the side gear turning with new clutch plates is 100 to 125 ft-lbs. On re-used clutch plates, the torque required is 50 ft-lbs. minimum.

7. If the differential bearings have been removed, press them on as shown in Fig. 24.

INSTALLATION OF DRIVE PINION AND DIFFERENTIAL CASE

1. Place the shim and pinion rear bearing cone on the pinion shaft. Press the bearing and shim firmly against the pinion shaft shoulder (Fig. 18).

2. Place a **new** pinion bearing preload spacer on the pinion shaft.

3. Lubricate the pinion rear bearing with axle lubricant.

4. Lubricate the pinion front bearing cone and place it in the housing.

5. Install a new pinion oil seal in the carrier casting (Fig. 12).

6. Insert the drive pinion shaft flange into the seal and hold it firmly against the pinion front bearing cone. From the rear of the carrier casting, insert the pinion shaft into the flange.

7. Start a new pinion shaft nut. Hold the flange with the tool shown

in Fig. 10 and tighten the pinion shaft nut. As the pinion shaft nut is tightened, the pinion shaft is pulled into the front bearing cone and into the flange.

As the pinion shaft is pulled into the front bearing cone, pinion shaft end play is reduced. While there is still end play in the pinion shaft, the flange and cone will be felt to bottom. This indicates that the bearing cone and flange have bottomed on the collapsible spacer.

From this point, a much greater torque must be applied to turn the pinion shaft nut, since the spacer must be collapsed. From this point, also, the nut should be tightened very slowly and the pinion shaft end play checked often, so that the pinion bearing preload does not exceed the limits.

If the pinion shaft nut is tightened to the point that pinion bearing preload exceeds the limits, the pinion shaft must be removed and a new collapsible spacer installed. **Do not decrease the preload by loosening the pinion shaft nut.** This will remove the compression between the pinion front and rear bearing cones and the collapsible spacer and may permit the front bearing cone to turn on the pinion shaft.

8. As soon as there is preload on the bearings, **turn the pinion shaft in both directions several times to set the bearing rollers.**

9. Adjust the bearing preload to specification. Measure the preload with the tool shown in Fig. 29.

10. Apply a thin coating of lubricant on the bearing bores so that the differential bearing cups will move easily.

11. Place the cups on the bearings and set the differential case assembly in the carrier casting (Fig. 17).

If the gear set is of the **non-hunting** or **partial non-hunting** type, assemble the differential case and ring gear assembly in the carrier so that the marked tooth on the pinion indexes between the marked teeth on the ring gear as shown in Fig. 30.

In almost every case of improper assembly (gears assembled out of time), the noise level and probability of failure will be higher than they would be with properly assembled gears.

When installing the **hunting** type gear set (no timing marks), assemble the differential case and ring gear assembly in the carrier without regard to the matching of any particular gear teeth.

12. Slide the case assembly along the bores until a slight amount of backlash is felt between the gear teeth. Hold the differential case in place.

13. Set the adjusting nuts in the bores so that they just contact the bearing cups.

14. Carefully position the bearing caps on the carrier casting. Match the marks made when the caps were removed.

15. Install the bearing cap bolts and lockwashers. As the bolts are tightened, turn the adjusting nut with the tool shown in Fig. 31.

16. If the adjusting nuts do not turn freely as the cap bolts are tightened, remove the bearing caps and again inspect for damaged threads or incorrectly positioned caps. Tightening the bolts to the specified torque is done to be sure that the cups and adjusting nuts are seated. Loosen the cap bolts, and torque them to only 5 ft-lbs before making adjustments. Refer to part 4-1 for backlash and bearing preload adjustment procedures.

5 MAJOR REPAIR OPERATIONS—REMOVABLE CARRIER TYPE AXLES

DISASSEMBLY

After removing the carrier from the axle housing as described in Section 3, mount the carrier in a holding fixture and perform the Inspection Before Disassembly of Carrier as explained in Part 4-1, Section 3. Then disassemble the carrier as outlined in the following procedures.

REMOVAL AND DISASSEMBLY OF CONVENTIONAL DIFFERENTIAL CASE

1. Mark one differential bearing cap and the mating bearing support with punch marks to help position the parts properly during assembly of the carrier. Also, mark one of the bearing adjusting nuts and the carrier with scribe marks for proper location during assembly (Fig. 44).

2. Remove the adjusting nut locks, bearing caps, and adjusting nuts. Then lift the differential assembly out of the carrier.

3. If the differential bearings are to be removed, use the tool shown in Fig. 19. On vehicles equipped with high performance engines, use tool T57L-4220-A.

4. Mark the differential case, cover, and ring gear for assembly in the original position.

5. Remove the bolts that attach the ring gear to the differential case. Press the gear from the case or tap it off with a soft-faced hammer.

6. With a drift, drive out the differential pinion shaft lock pin (Fig. 32) and separate the 2-piece differential case.

7. Drive out the pinion shaft with a brass drift (Fig. 33).

8. Remove the gears and thrust washers. (Fig. 34).

REMOVAL AND DISASSEMBLY OF LIMITED-SLIP DIFFERENTIAL CASE

1. Remove the differential case from the carrier and remove the bearings from the differential as outlined in steps 1 through 4 in the foregoing procedure.

2. Place the differential case in a hydraulic press, and apply about one ton pressure across the case bearing hubs while removing the ring gear attaching bolts. This procedure will contain the spring pressure between the differential case and cover until after the bolts are moved, and thereby prevent stripping of the threads. Loosen **alternate** bolts an **equal** amount so that the spring pressure will release evenly.

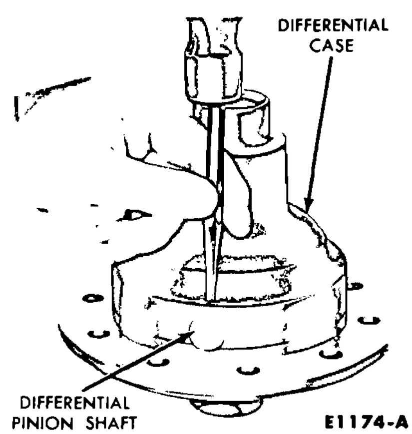


FIG. 32—Removing Differential Pinion Shaft Lock Pin

3. Release the hydraulic press

ram, and remove the differential case cover.

4. Remove the Belleville spring (Fig. 21).

5. Remove the steel and the bonded clutch plates.

6. Remove the differential clutch hub, outer side gear, and thrust washer.

7. Remove the ring gear from the differential case.

8. Drive out the differential pinion shaft lock pin.

9. With a brass drift, drive out the differential pinion shaft. Then remove the pinion gears, inner side gear, and thrust washers.

REMOVAL AND DISASSEMBLY OF DRIVE PINION AND BEARING RETAINER

1. Turn the carrier case upright, and remove the pinion shaft nut (Fig. 35). Then remove the U-joint flange (Fig. 36).

2. Remove the seal (Fig. 37) and the slinger.

3. Remove the pinion, bearing, and retainer assembly from the carrier housing (Fig. 47). Measure the shim thickness with a micrometer. Record this original shim thickness. If a new gear set is installed during assembly, a new shim will have to be installed. The original shim thickness is one of the factors necessary in determining the new shim thickness. **Extreme care must be taken not to damage the mounting surfaces of the retainer and carrier.**

4. Place a protective sleeve (hose) on the pinion pilot bearing surface. Press the pinion shaft out of the pinion front bearing cone (Fig. 38).

5. Press the pinion shaft out of the pinion rear bearing cone (Fig. 39).

PARTS REPAIR OR REPLACEMENT

Clean and inspect all the parts as outlined in Part 4-1, Section 3. Before assembling the carrier, repair or replace all parts as indicated by the inspection.

The principal replacement operations are covered in the following procedures. All other repair or replacement operations are performed during Cleaning and Inspection Part 4-1, Section 3, or during the Assembly in this section.

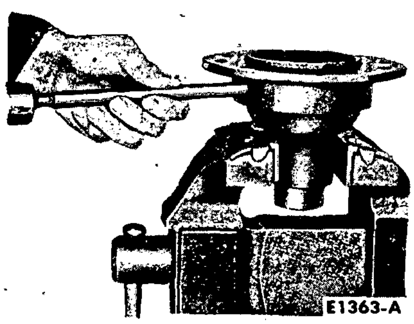


FIG. 33—Driving Out Differential Pinion Shaft

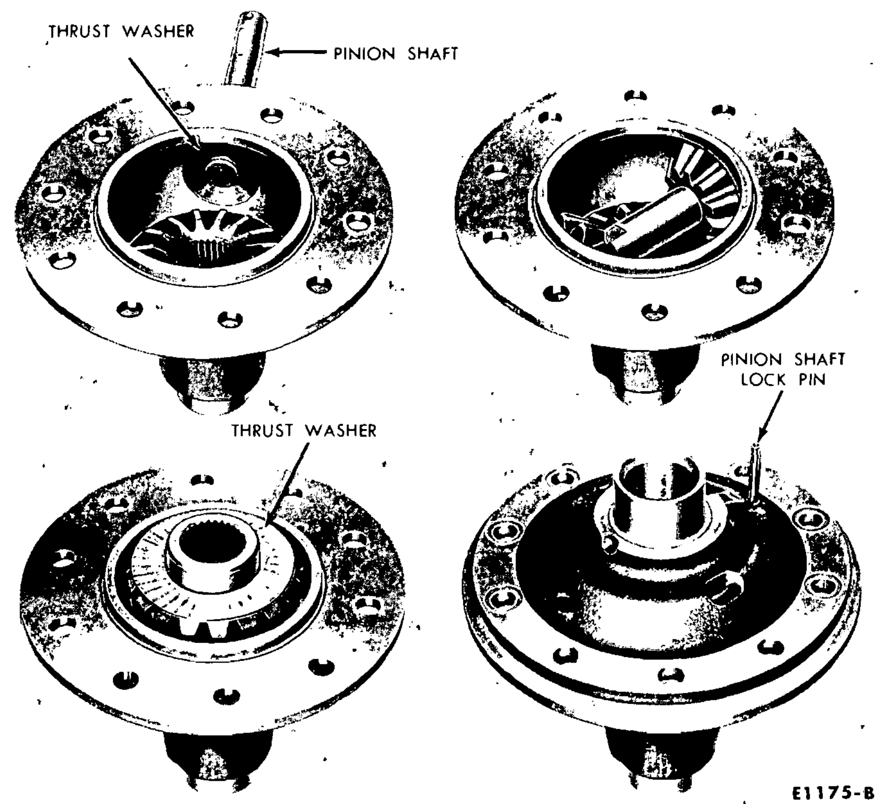


FIG. 34—Assembly of Differential Case

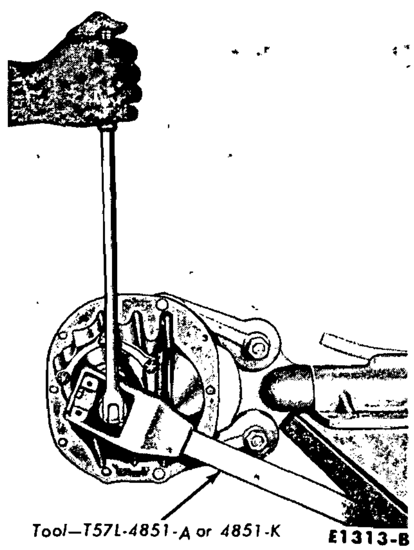


FIG. 35—Removing Pinion Shaft Nut

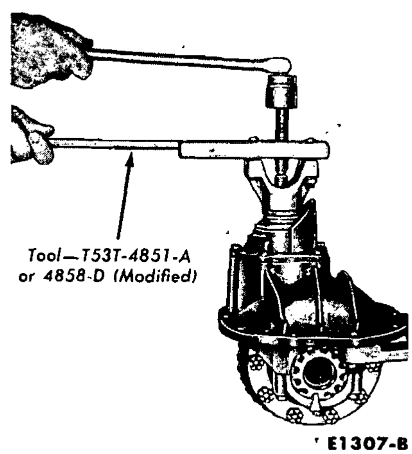


FIG. 36—Removing U-Joint Flange

PILOT BEARING

1. Remove the pilot bearing as shown in Fig. 40. Drive out the pilot bearing and the bearing retainer together. On vehicles with high performance engines, use handle adapter T53L-200A with tool 757L-4625-A or 4625-K.

2. Drive the new bearing in until it bottoms as shown in Fig. 41. On vehicles with high performance engines, use handle adapter 753L-200A with tool 753L-4625-A, or 4625-K, or 4625-KA.

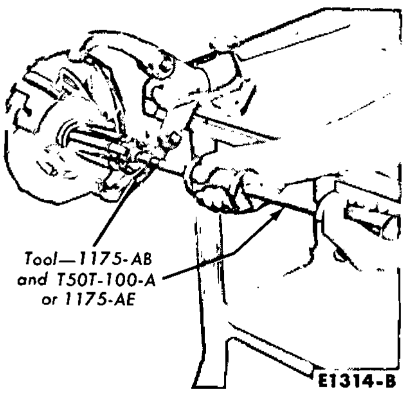


FIG. 37— Removing Pinion Seal

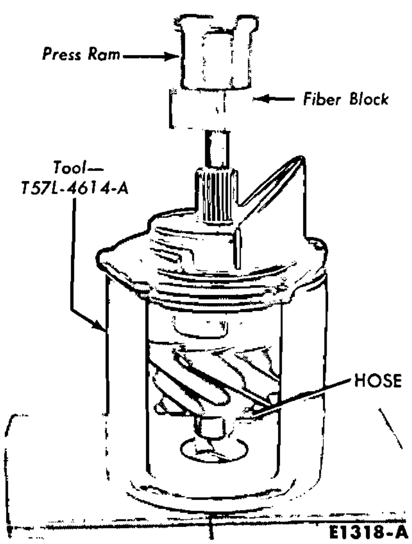


FIG. 38— Removing Pinion Front Bearing Cone

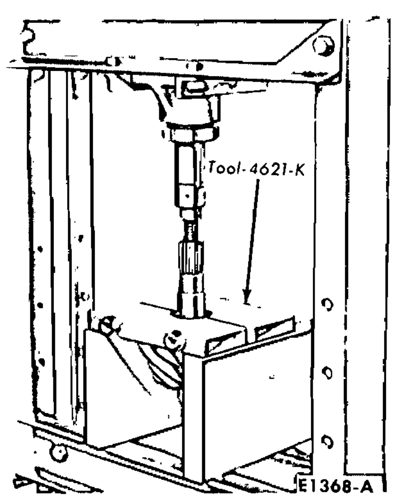


FIG. 39— Removing Pinion Rear Bearing Cone

3. Using the same tool, install a new pilot bearing retainer with the concave side up.

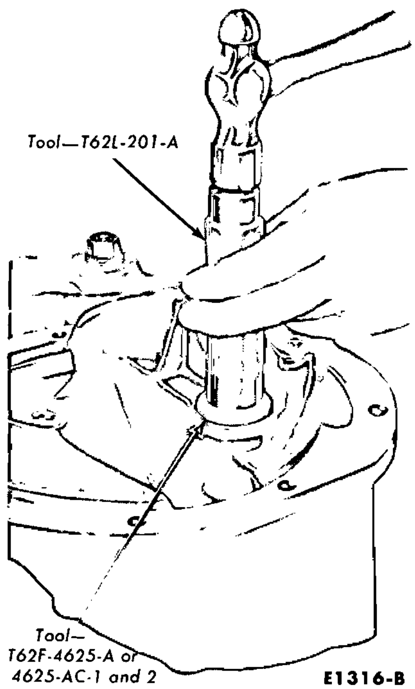


FIG. 40— Removing Pilot Bearing

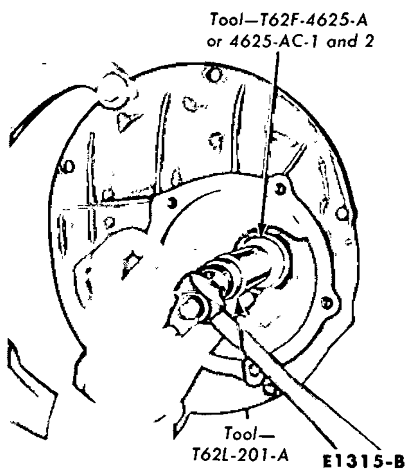


FIG. 41— Installing Pilot Bearing

PINION BEARING CUPS

Do not remove the pinion bearing cups from the retainer unless the cups are worn or damaged. The flange and pilot of the retainer are machined during manufacture by locating on these cups after they are installed in their bores. If the cups are worn or damaged, they should be removed and replaced as shown in Fig. 42. On vehicles equipped with high performance engines, use the following tools: T57L-4614-A with T57L-4616-A for front cup removal except Comet; tool 4615-D for Comet front cup removal; T57L-4614-A with T57L-4616-A2 for front cup installation and T57L-4614-A with T55P-4616-A2 for rear cup installation.

After the new cups are installed (Fig. 43), make sure they are seated in the retainer by trying to insert a 0.0015-inch feeler gauge between the cup and the bottom of the bore.

Whenever the cups are replaced, the cone and roller assemblies should also be replaced.

DRIVE PINION AND GEAR SET

When replacing a ring gear and pinion, note that the original factory installed shim is of the correct thickness to adjust for individual variations in both the carrier housing dimension and in the original gear set dimension. Therefore, to select the correct shim thickness for the new gear set to be installed, follow these steps:

1. With a micrometer, measure the thickness of the original shim removed from the axle and use the same thickness upon installation of the replacement carrier assembly or drive pinion.

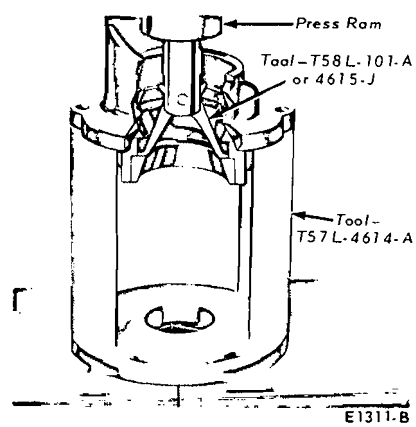


FIG. 42— Removing Pinion Bearing Cup

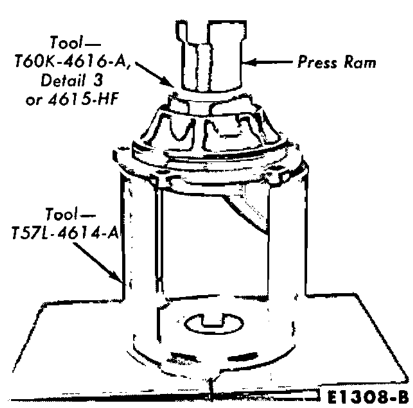


FIG. 43— Installing Pinion Bearing Cup

If further shim change is necessary, it will be indicated in the tooth pattern check.

2. If the original shim is lost, substitute a nominal shim for the original and use the tooth pattern check to determine if further shim changes are required. Nominal shim thickness is indicated in Part 4-3, Specifications.

A new ring gear and pinion should always be installed in an axle as a matched set (never separately). **Be sure the same identifying (matching) number, painted in white, appears on the bolt hole face of the ring gear and on the head of the drive pinion (Fig. 23).**

3. After determining the correct shim thickness as explained in the foregoing steps, install the new pinion and ring gear as outlined under Assembly.

DIFFERENTIAL CASE, BEARINGS AND RING GEAR

If the ring gear runout check (before disassembly) exceeded specifications, the conditon may be caused by a warped gear, a defective case, or excessively worn differential bearings.

To determine the cause of excessive runout proceed as follows:

1. Assemble the two halves of the differential case together **without** the ring gear, and press the two differential side bearings on the case hubs.

2. Place the cups on the bearings and set the differential case in the carrier.

3. Install the bearing caps and adjusting nuts as outlined in step 11 thru 14 under Assembly and Installation of Conventional Differential Case in this section.

4. Tighten the right nut two notches beyond the position where it first contacts the bearing cup. Rotate the differential case several revolutions in each direction while the bearings are loaded to seat the bearings in their cups. **This step is important.**

5. Again loosen the right nut to release the preload. Check to see that the left nut contacts the bearing cup. Using the dial indicator setup shown in Fig. 18, Part 4-1, adjust the preload to 0.012 case spread for new bearings or 0.005 to 0.008 for the original bearings, if re-used.

6. Check the runout of the differential case flange with a dial indicator. If the runout does **not now** exceed specifications, install a new drive gear. If the runout still exceeds specifications, the ring gear is true and the trouble is due to either a defective case or worn bearings.

7. Remove the differential case from the carrier and remove the side bearings from the case.

8. Install **new** bearings on the case hubs, and again install the differential assembly in the carrier **without** the ring gear.

9. Check the case runout again with the new bearings. If the runout is **now** within limits, the old bearings were excessively worn. Use the new bearings for assembly. If the runout is still excessive, the case is defective and should be replaced.

ASSEMBLY

Refer to Part 4-1 for Cleaning and Inspection before starting assembly operations. Fig. 44 shows the disassembled parts.

ASSEMBLY AND INSTALLATION OF DRIVE PINION AND BEARING RETAINER

1. Install the drive pinion rear bearing cone and roller on the pinion shaft (Fig. 45). On vehicles equipped with high performance engines use tool T57L-4621-B along with tool 757L-4614-A as shown in Fig. 45. Place a new spacer on the pinion shaft (Fig. 46).

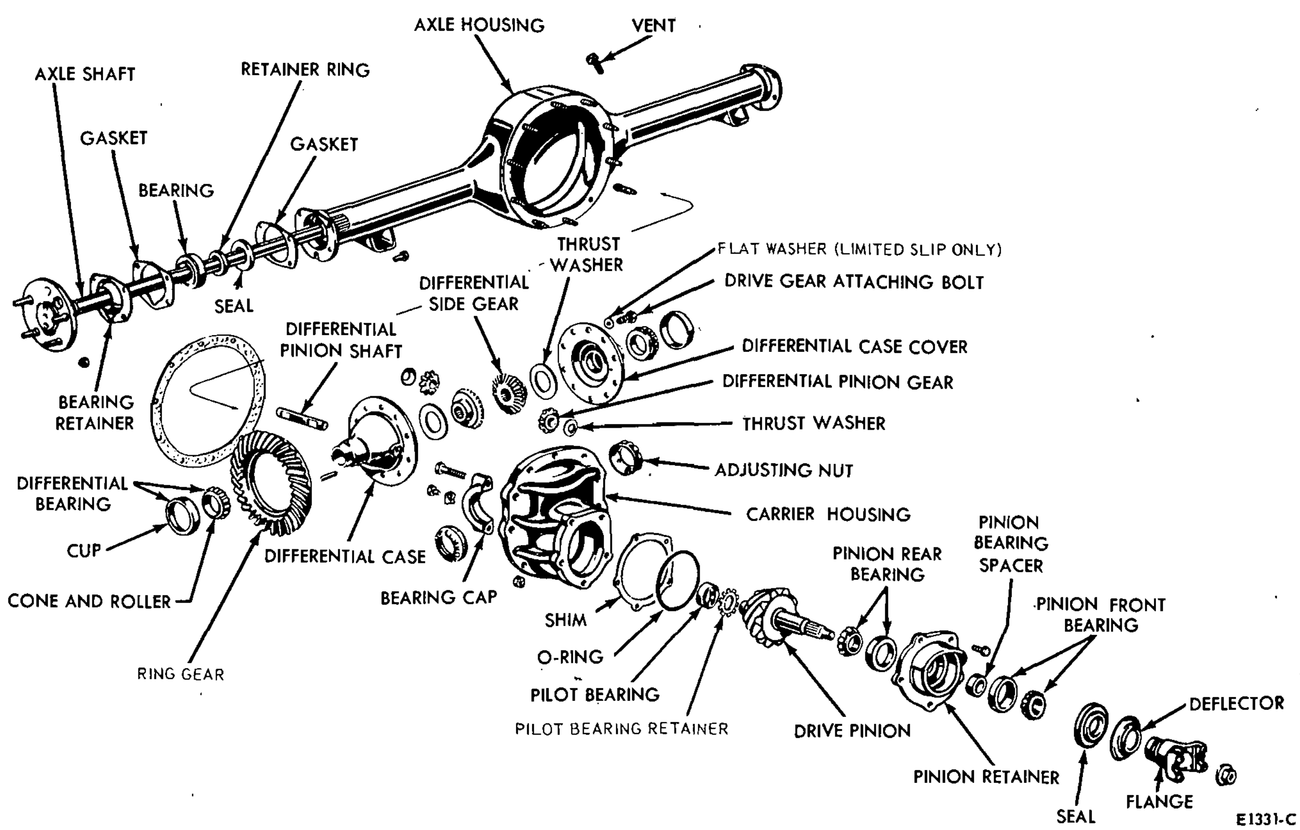


FIG. 44— Rear Axle—Disassembled

2. Place the bearing retainer on the pinion shaft, and install the front bearing cone and roller in the retainer. Press the front bearing cone and roller into position with the same tools as used in Fig. 45 for front bearing installation. On vehicles with high performance engines, use T57L-4621-B along with tool T57L-4614-A.

3. Lubricate the O-ring with axle lubricant and install it in its groove in the pinion retainer. Be careful not to twist it. Snap the O-ring into position.

4. Place the proper shim on the carrier housing and install the pinion and retainer assembly being careful not to pinch the O-ring (Fig. 47).

5. Install the pinion retainer bolts. Torque bolts to specifications.

6. Install a new pinion oil seal in the bearing retainer Fig. 48. On vehicles with high performance engines, use tool T58L-4676-A or tool 4676-F.

New seals should be soaked in SAE 10 oil for 1/2 hour before use.

7. Install the U-joint flange (Fig. 49).

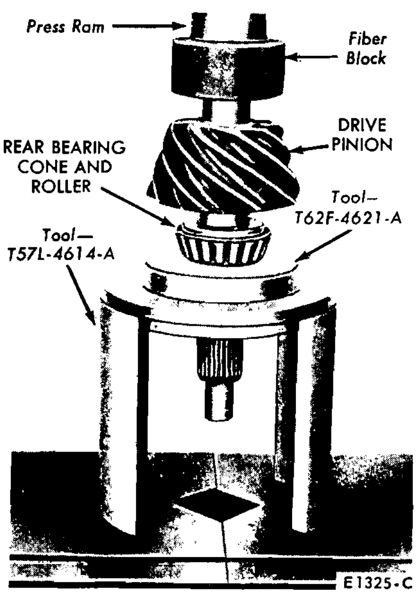


FIG. 45—Installing Pinion Rear Bearing Cone

8. Start a new integral nut and washer on the pinion shaft.

9. Hold the flange (Fig. 35) and tighten the pinion shaft nut to 175 ft-lbs. Do not exceed 175 ft-lbs at this time. As the pinion shaft nut is tightened, rotate the pinion shaft frequently to allow the bearing to seat.

10. Check the pinion bearing preload as shown in Fig. 50. If an inch-pound torque wrench is not available tool 4209-C may be used in combination with tool 4209-C12. Correct preload will be obtained when the torque required to rotate the pinion in the retainer is as specified in Part 4-3. If the torque required to rotate the pinion is less then specified, tighten the pinion shaft nut a little at a time until the proper preload is extablished. **Do not overtighten the nut.** If excessive preload is obtained as a result of overtightening, replace the collapsible bearing spacer.

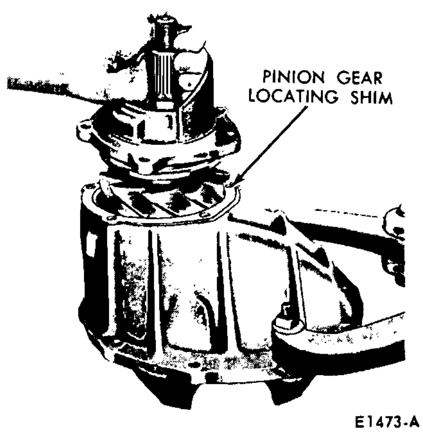


FIG. 47—Installing Pinion and Retainer

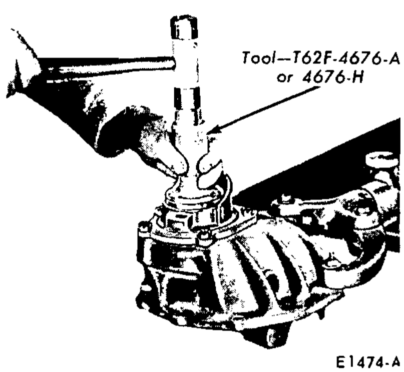


FIG. 48—Installing Oil Seal

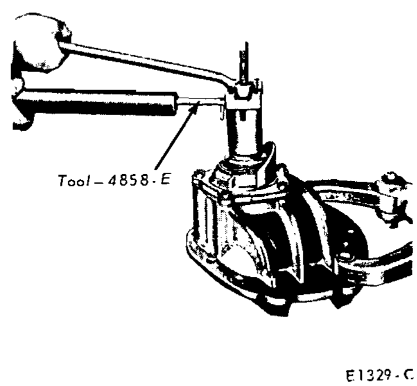


FIG. 49—Installing U-Joint Flange

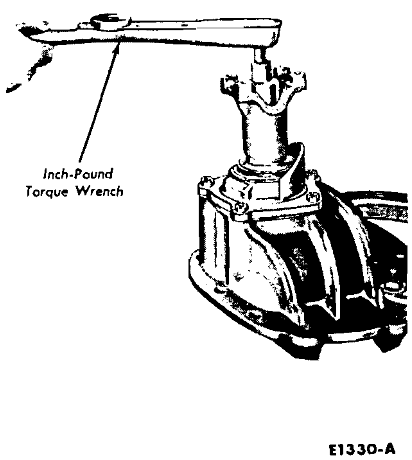


FIG. 50—Checking Pinion Bearing Pre-load

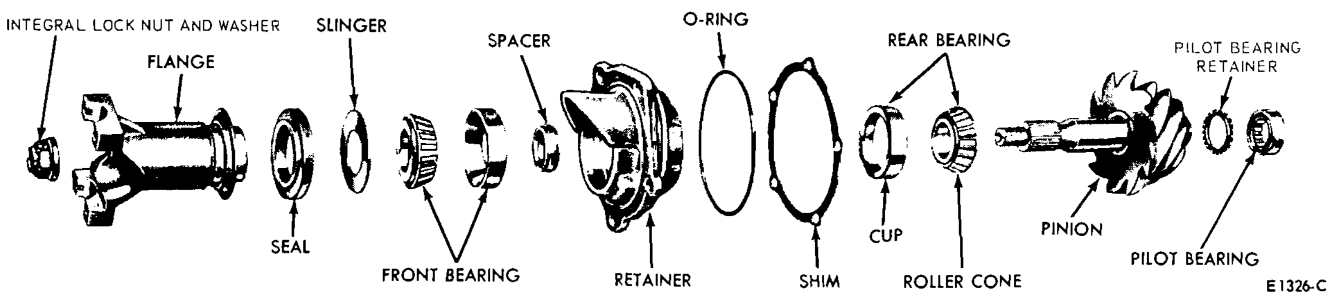


FIG. 46—Pinion and Bearing Retainer

Do not back off the pinion shaft nut to establish pinion bearing preload. If the torque on the pinion shaft nut is less than 175 ft-lbs. after bearing preload is established, a new collapsible spacer must be used.

ASSEMBLY AND INSTALLATION OF CONVENTIONAL DIFFERENTIAL CASE

1. Place a side gear and thrust washer in the differential case bore (Fig. 34). **Lubricate all differential parts liberally with axle lubricant during assembly.**
2. With a soft-faced hammer, drive the pinion shaft into the case only far enough to retain a pinion thrust washer and pinion gear.
3. Place the second pinion and thrust washer in position, and drive the pinion shaft into place. **Carefully line up the pinion shaft lock pin holes.**
4. Place the second side gear and thrust washer in position (Fig. 34), and install the cover on the differential case. Install the pinion shaft lock pin. A pinion or axle shaft spline can be inserted in the side gear spline to check for free rotation of the differential gears.
5. Insert two 7/16 (N. F.) bolts two inches long through the differential case flange, and thread them three or four turns into the ring gear as a guide in aligning the ring gear bolt holes. Press or tap the ring gear into position.
6. Install and tighten the ring gear bolts evenly, and torque them alternately across the gear to specification.
7. If the differential bearings have been removed, press them on as shown in Fig. 51.
8. Apply a thin coating of lubricant on the bearing bores so that the differential bearing cups will move easily.
9. Place the cups on the bearings. If the gear set is of the **non-hunting** or **partial non-hunting** type, assemble the differential case and ring gear assembly in the carrier so that the marked tooth on the pinion indexes between the marked teeth on the ring gear as shown in Fig. 30.

In almost every case of improper assembly (gears assembled out of time), the noise level and probability of failure will be higher than they would be with properly assembled gears.

When installing the **hunting** type gear set (no timing marks) assemble the differential case and ring gear assembly in the carrier without regard to the matching of any particular gear teeth.

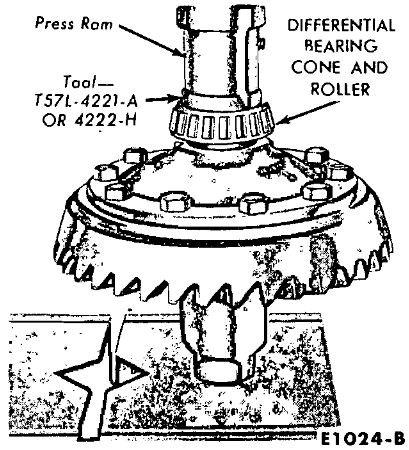


FIG. 51—Installing Differential Bearing

10. Slide the assembly along the bores until a slight amount of backlash is felt between the gear teeth.
11. Set the adjusting nuts in the bores so that they just contact the bearing cups. The nuts should be engaged about the same number of threads on each side.
12. Carefully position the bearing caps on the carrier. Match the marks made when the caps were removed.
13. Install the bearing cap bolts and alternately torque them to specification.
14. If the adjusting nuts do not turn freely as the cap bolts are tightened, remove the bearing caps and again inspect for damaged threads or incorrectly positioned caps. Tightening the bolts to the specified torque is done to be sure that the cups and adjusting nuts are seated. Loosen the cap bolts, and torque them to only 25 ft-lbs. before making adjustments.
15. Adjust the backlash between the ring gear and pinion as outlined in Part 4-1, Section 2.
16. Be sure to make a final tooth pattern check before installing the carrier assembly in the axle housing.

ASSEMBLY AND INSTALLATION OF LIMITED-SLIP DIFFERENTIAL CASE

1. Place the side gear and thrust washer in the differential case (Fig. 21). **Lubricate all parts liberally with axle lubricant during assembly.**
2. With a soft-faced hammer, drive the pinion shaft into the case only far enough to retain a pinion thrust washer and pinion gear.
3. Place the second pinion and thrust washer in position, and drive the pinion shaft into place. **Carefully line up the pinion shaft lock pin holes.**
4. Install the pinion shaft lock pin. **The lock pin must not extend beyond the surface of the case.**
5. Insert two 2-inch 7/16 (N. F.) bolts through the differential case flange, and thread them three or four turns into the ring gear as a guide in aligning the ring gear bolt holes. Press or tap the ring gear into position.
6. Clamp the differential case in a soft-jawed vise. Install the other differential side gear on the differential.

Clutch Plate Installation

Prior to clutch plate installation, the friction bonded plates must be soaked in C6AZ-19580-C (ESW-M2C104-A) differential lubricant for approximately 1/2 hour. In addition, the differential lubricant must be liberally applied to all components to be assembled.

1. Place the clutch hub into position in a soft-jawed vise.
2. First, install a steel clutch plate in the cavity of the right hand case and then a bonded friction plate (Fig. 25). **Make sure the bonded friction plate inner-spline teeth properly engage the hub spline.** Install the remaining plates: a steel plate, bonded friction plate, a steel plate, bonded friction plate and lastly a steel plate.
3. Center the Belleville spring on the clutch pack (spring concave-side facing downward on the pack) to prevent trapping the spring between the left and right hand case in an eccentric position (Fig. 26). **Improper location of the Belleville spring will cause extremely high torque and differential chatter. Be sure the slots in the rabbit ears of the steel plates are in proper alignment.**
4. Carefully set the differential case cover over the right hand case (Fig. 27). **At this point, no force or pressure should be applied to the cover. The cover contains two 3/16 inch holes by which the clutch plates can be properly aligned.** Insert the shank ends of two 1/8 inch drill bits into the holes, and work the drill bits back-and-forth until the plates are centered (Fig. 28). When the clutch plates are centered, the weight of the cover will cause it to fall into position. Remove the drill bits.
5. Install the ring gear to differential case bolts, and tighten them evenly and alternately across the diameter of the ring gear. Tighten the bolts to specification.
6. Prior to installation of the limited slip differential into the vehicle,

a differential torque check must be made. Check the torque required to rotate one side gear while the other side gear is held. **The initial break-away torque required to start the side gear turning should be ignored and only the rotating torque required to keep it moving steadily should be recorded.** The torque required to keep the side gear turning with new clutch plates is 100 to 125 ft-lbs. On re-used clutch plates, the torque required is 50 ft-lbs. minimum.

7. If the differential bearings have been removed, press them on as shown in Fig. 24.

8. Install the side bearings on the differential case, and install the case in the carrier as described in steps 7 through 16 under Assembly and Installation of Conventional Differential Case.

PART 4-3—Specifications

REAR AXLE RATIOS, GEAR AND CODE IDENTIFICATION

Identification Tag	Ring Gear Diameter (Inches)	Type of Differential	Axle Ratio	No. of Teeth Ring Gear	No. of Teeth Pinion
WCY-R1	7-1/4	Conventional	2.83:1	34	12
WCY-E1	7-1/4	Conventional	3.20:1	32	10
WCY-AJ1	7-1/4	Conventional	3.20:1	32	10
WCZ-F1	8	Conventional	3.00:1	39	13
WDJ-C1	8	Limited Slip	3.00:1	39	13
WDV-A	7-1/4	Conventional	2.83:1	34	12
WDV-B	7-1/4	Conventional	2.83:1	34	12
WDV-C	7-1/4	Conventional	3.20:1	32	10
WDV-E	7-1/4	Limited Slip	3.20:1	32	10
WDV-G	7-1/4	Conventional	3.20:1	32	10
WDV-H	7-1/4	Limited Slip	3.20:1	32	10
WDW-K	8	Conventional	2.79:1	39	14
WDW-B	8	Conventional	3.00:1	39	13
WDW-C	8	Conventional	3.25:1	39	12
WDW-D	8	Conventional	3.50:1	35	10
WDW-J	8	Conventional	2.79:1	39	14
WDW-F	8	Conventional	3.00:1	39	13
WDY-A1	8	Conventional	3.00:1	39	13
WDY-B1	8	Conventional	3.25:1	39	12
WCZ-V	8	Conventional	2.79:1	39	14
WDY-C1	8	Conventional	3.50:1	35	10
WDZ-B	8	Limited Slip	3.00:1	39	13
WDZ-C	8	Limited Slip	3.25:1	39	12
WDZ-E	8	Limited Slip	3.00:1	39	13
WEA-A1	8	Limited Slip	3.00:1	39	13

Identification Tag	Ring Gear Diameter (Inches)	Type of Differential	Axle Ratio	No. of Teeth Ring Gear	No. of Teeth Pinion
WEA-B1	8	Limited Slip	3.50:1	35	10
WEA-F1	8	Limited Slip	3.25:1	39	12
WEB-B5	9	Conventional	3.00:1	39	13
WEB-C5	9	Conventional	3.25:1	39	12
WEB-E5	9	Conventional	3.00:1	39	13
WEB-F5	9	Conventional	3.25:1	39	12
WEC-A5	9	Conventional	3.00:1	39	13
WEC-B5	9	Conventional	3.25:1	39	12
WEC-D5	9	Conventional	3.00:1	39	13
WEC-E5	9	Conventional	3.25:1	39	12
WED-A5	9	Limited Slip	3.25:1	39	12
WED-C5	9	Limited Slip	3.00:1	39	13
WED-D5	9	Limited Slip	3.00:1	39	13
WEE-C5	9	Limited Slip	3.00:1	39	13
WEE-D5	9	Limited Slip	3.00:1	39	13
WES-F	9	Conventional	3.00:1	39	13
WES-G	9	Limited Slip	3.25:1	39	12
WEB-G	9	Conventional	3.89:1	35	9
WEB-H	9	Conventional	2.75:1	44	16
WEB-J	9	Conventional	2.75:1	44	16
WEC-F	9	Conventional	2.75:1	44	16
WEC-G	9	Conventional	2.75:1	44	16
WES-H	9	Conventional	3.50:1	35	10
WES-J	9	Conventional	3.89:1	35	9
WES-K	9	Limited Slip	3.50:1	35	10

ADJUSTMENTS

Description	Inch
Maximum Runout of Backface of Ring Gear	0.003
Differential Side Gear Thrust Washer Thickness	0.030–0.032
Differential Pinion Gear Thrust Washer Thickness	0.030–0.032
Drive Pinion Bearing Solid Spacers (Used with 9-3/8 ring gear) 6 Spacers in increments of 0.002 inch 14 Spacers in increments of 0.001 inch	 0.466–0.476 0.477–0.490
Differential Bearing Preload (Case Spread Across Differential) New Bearings Original Bearings 7-1/4 Ring Gear 7-3/4, 8, 8-3/4, 9, Ring Gear	 0.008–0.012 0.003–0.005 0.005–0.008

Description	Inch
Nominal Pinion Locating Shim Comet, Falcon, Fairlane, Mustang, Cougar Integral Carrier Type—Rear Bearing Cone to Pinion Gear	 0.017
Removable Carrier Type 8 Dia Ring Gear	 0.022
8-3/4 - 9 Dia Ring Gear	0.015
Available Pinion Shims (In steps of 0.001 inch) Comet, Falcon, Fairlane, Mustang, Cougar Integral Carrier Type 7-1/4 Ring Gear 8–9 Ring Gear	 0.008–0.024 0.010–0.029
Backlash Between Ring Gear and Pinion	0.008–0.012
Maximum Backlash Variation Between Teeth	0.003

REAR AXLE TORQUE LIMITS (FT-LBS)

Description		Integral Carrier	Removable Carrier 7-3/4"-8"	Removable Carrier 9"
Differential Bearing Cap Bolts		40–55	55–70	70–85
Differential Bearing Adjusting Nut Lock Bolts		12–25	12–25	12–25
Carrier to Housing Stud Nuts			30–40	30–40
Pinion Retainer to Carrier Bolts			30–45	30–45
Ring Gear Attaching Bolts		40–55	65–80	65–80
Rear Axle Shaft Bearing Retainer Bolts		30–40	30–40	30–40
Rear Shock Absorber to Spring Clip Plate Assembly Nuts		15–25	15–22	15–22
Pinion Flange U-Bolt Nuts		7–10	12–15	12–15
Spring Clip Nuts (Rear Spring to Axle Housing)		13–20	30–45	30–45
Minimum Torque Required to Tighten Pinion Nut to Obtain Correct Pinion Bearing Preload		140	175 ①	175 ①
Rear Cover Bolts		25–35		
Pinion Bearing Preload (Collapsible Spacer)	New Bearings (In-Lbs)	17–27	17–32 ②	22–32 ②
	Original Bearings (In-Lbs)	6–12	8–14	8–14
Differential Bearing Preload (Case Spread)	New Bearings	0.008–0.012	0.008–0.012	0.008–0.012
	Original Bearings	0.003–0.005	0.005–0.008	0.005–0.008

① If This Torque Cannot be Obtained With a Used Spacer, Install a New Spacer.
② And New Seal.

TORQUE CHECK (FT-LBS) REAR AXLES WITH LIMITED-SLIP DIFFERENTIAL

Minimum Torque Required to Turn Axle Shaft and Gear		All Axles Except Integral Carrier Type	Integral Carrier Type
With One Wheel on the Ground		75	50
Bench Check	With New Clutch Plates	155–195	100–125
After Assembly	With Original Clutch Plates	75 Min	50 Min

LUBRICANT CAPACITIES

	U.S. Measure Capacity (Pints)	Imperial Measure Capacity (Pints)
7-1/4 inch Conventional ①	2-1/2	2
7-3/4–8 inch Conventional ①	4.0	3-1/5
9 inch Conventional ①	5.0	4.0
9 inch Limited Slip ②	5.0	4.0
74-1/4 inch Limited Slip ②	2-1/2	2
8 inch Limited Slip ②	4.0	3-1/5

① All conventional axles use ESW-M2C105-A lubricant (C6AZ-19580-B).
② All limited slip axles use ESW-M2C104-A lubricant (C6AZ-19580-C).

SPECIAL TOOLS

Ford Tool No.	Former No.	Description
T50T-100-A	B-166	Impact Hammer
T58L-101-A		Puller Attachment
T62L-201-A	—	Handle Adapter
T56L-400-A	4851-A	Puller
T57L-500-A	—	Bench Mounted Holding Fixture
TOOL-1175-AB	1175-AB	Grease Seal Remover (Head Only)
T50T-100-A and TOOL-1175-AB	1175-AE	Seal Remover
T60K-1177-B	1177-B	Rear Wheel Bearing Oil Seal
T60K-1225-A or TOOL-1225-C	—	Axle Shaft Bearing Remover and Replacer Axle Shaft Bearing Remover
TOOL-1225-B		Axle Shaft Bearing Replacer
TOOL-T54-P-3044-A	—	Front Suspension Upper and Lower Arm Overhaul Tool Kit
TOOL-T57L-4067-A	4067-B	Differential Bearing Adjuster Nut Wrench
T601C-4067-A	4067-E	Differential Bearing Adjuster Nut Wrench
TOOL-4201-C and D	4201-C	Differential Backlash and Runout Gauge With Universal Bracket, Dial Indicator and Bracket
T66L-4204-L	4221 or 4211-A	Limited-Slip Differential Check
TOOL-4221-AL	4221-AL	Differential Bearing Cone Remover Pilot (Use with TOOL-4221-C or TOOL-4851-A)
T57L-4221-A	4222-K	Differential Bearing Cone Replacer
TOOL-4222-H	4222	Differential Bearing Cone Replacer
T60K-4234-A	4235-D	Rear Axle Shaft Assembly Remover Adapter

Ford Tool No.	Former No.	Description
TOOL-4235-C	4235-C	Differential Bearing Remover Adapter
T57L-4614-A	4614	Drive Pinion and Drive Pinion Retainer Assembly Support
TOOL-4615-J	4615-J	Drive Pinion Front Bearing Cup Remover
T60K-4616-A	4615-HF 4625-HR	Pinion Bearing Cup Replacer
T57L-4616-A	4615-E and F	Pinion Front Bearing Cup Remover
T57L-4616-A2	4615-E and F	Pinion Front Bearing Cup Replacer
T55P-4616-A2	—	Pinion Rear Bearing Cup Replacer
TOOL-4621-K	4621-K	Drive Pinion Rear Bearing Cone Remover
T62F-4621-A	—	Pinion Bearing Cone Replacer
T62F-4625-A	4625-AC 1 and 2	Drive Pinion Pilot Bearing Remover and Replacer
T55P-4676-A	4676-G	Drive Pinion Oil Seal Replacer
T62F-4676-A	4676-H	Drive Pinion Oil Seal Replacer
T53T-4851-A	4851-A 4858-D	Flange (Universal Joint) Axle End Remover
T57L-4851-A	4851-K	Universal Joint Flange Holder
TOOL-4858-E	4858-E	Companion Flange and Pinion Bearing Replacer
T65K-4204-A	—	Limited-Slip Differential Torque Check Adapter
T59L-4204-A	44211 and 44211-A	Locking Differential Torque Check
TOOL-6565-AB	6565-AB	Adapter
TOOL-6565	6565	Dial Indicator

Drive Shaft And Clutch

GROUP 5

PART 5-1 — *Drive Shaft*

1 DIAGNOSIS AND TESTING

DRIVE SHAFT BALANCE

If detailed parts of the drive shaft are replaced and shaft vibration is encountered after installation, disconnect the shaft at the slip yoke. Rotate the slip yoke and transmission output shaft 180 degrees; then, reconnect the shaft to the slip yoke. If the vibration persists, disconnect the shaft at the rear axle companion flange. Rotate the flange and drive pinion 180 degrees and reconnect the shaft to the flange.

DRIVE SHAFT VIBRATION OR SHUDDER

Vibration or shudder which is noticeable on fast acceleration, when coasting, or when using the engine for a brake, may be caused by improper pinion angle resulting in an improper drive shaft angle.

To diagnose drive shaft problems, refer to the Drive Shaft Trouble Diagnosis and Possible Causes (Fig. 6).

2 DESCRIPTION

The drive shaft is the means of transferring power from the engine, through the transmission, to the differential in the rear axle, and then to the rear wheels. The drive shaft incorporates two universal joints and a slip yoke (Fig. 1). The splines in the yoke and on the transmission output shaft permit the drive shaft to move forward and rearward as the axle moves up and down.

On Fairlane and Comet hardtop models, a vibration damper is attached to the bottom of the transmission extension housing, (Fig. 2). This damper absorbs drive line noise and vibration.

All drive shafts are balanced. If the car is to be undercoated, cover the drive shaft and universal joints to prevent application of the undercoating material.

3 REMOVAL AND INSTALLATION

REMOVAL

1. To maintain drive shaft balance, mark the relationship of the rear drive shaft yoke and the drive pinion flange of the axle (if the yellow alignment marks are not visible) with the shaft so that they may be installed in their original positions.

2. Disconnect the rear U-joint from the axle drive pinion flange. Wrap tape around the loose bearing caps to prevent them from falling off the spider. Pull the drive shaft toward the rear of the vehicle until the slip yoke clears the transmission expansion housing and the seal. Install the appropriate Extension Housing Seal Installation tool into the extension housing to prevent lubricant leakage. **The transmission seals and driveshaft bearing cup seals should not be washed, soaked or cleaned in any cleaning solvent.**

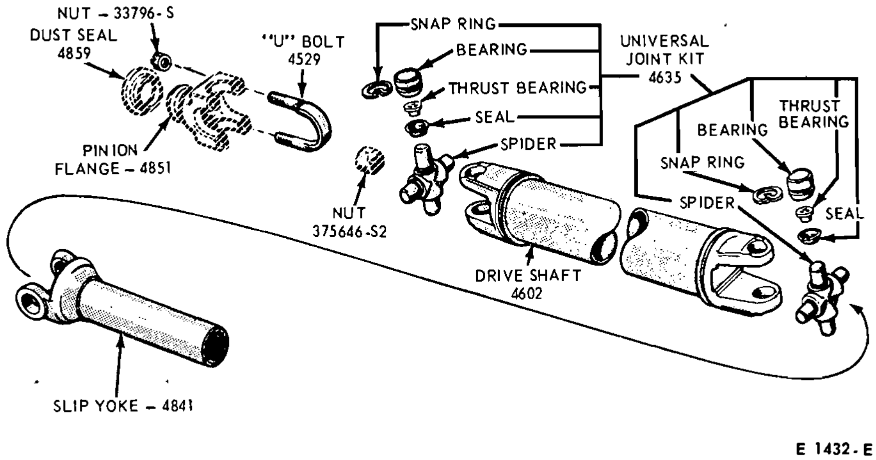


FIG. 1—Drive Shaft and Universal Joints Disassembled

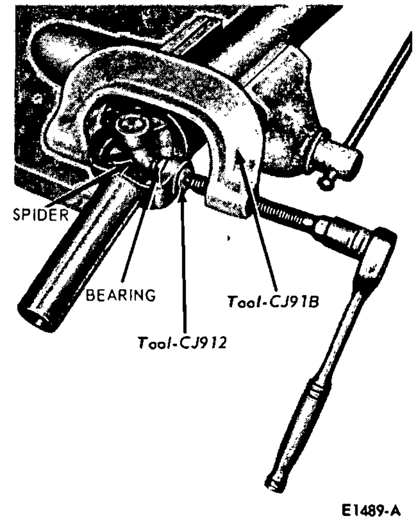


FIG. 4—Removing Universal Joint Bearing

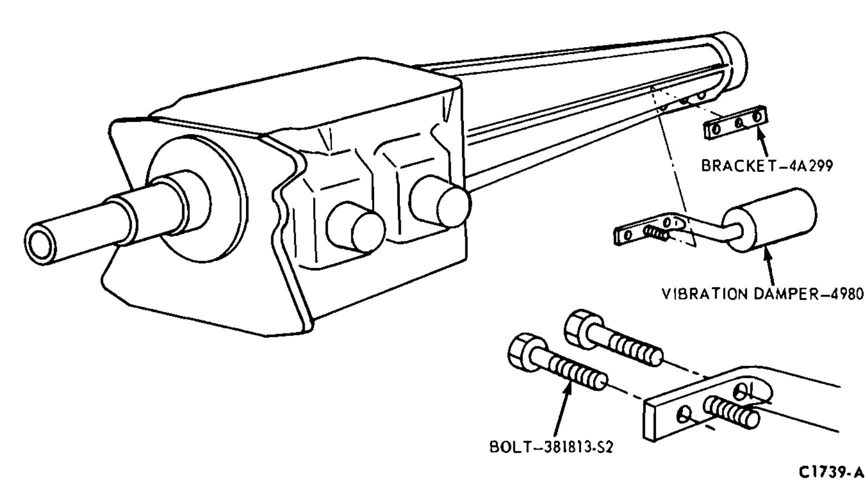


FIG. 2—Vibration Damper—Fairlane and Comet Hardtop Models

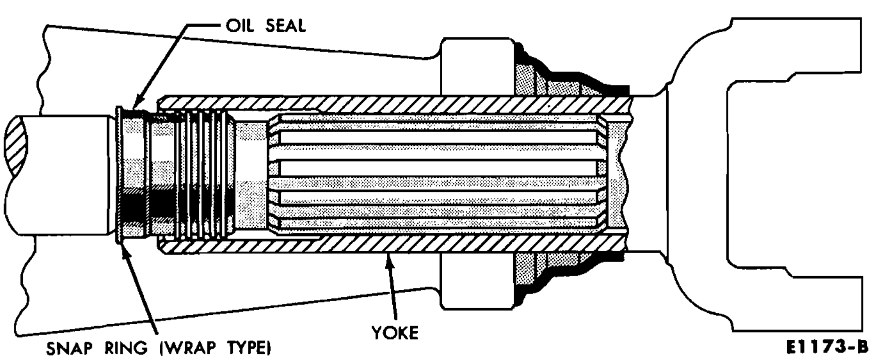


FIG. 3— Output Shaft Spline Seal

INSTALLATION

1. If either the rubber seal on the output shaft or the seal and integral boot in the end of the transmission extension housing is damaged in any manner, replace the seal or seals as required. Also, if the lugs on the axle pinion flange are shaved or distorted so that the bearings slide, replace the flange.

2. Lubricate the yoke spline with B8A-19589-A lubricant. This spline is sealed so that the transmission fluid does not "wash" away the spline lubricant (Fig. 3). Remove the tool from the extension housing. Install the yoke on the transmission output shaft.

Install the driveshaft so that the index marks or the yellow mark (if visible) on the yoke is in line with the yellow mark on the axle pinion flange. This prevents vibration which occurs when the balance of the shaft and balance of the axle pinion flange become additive instead of neutralizing. If a vibration exists, the driveshaft should be disconnected from the axle, rotated 180 ° and reinstalled.

3. Install the U-bolts and nuts that attach the U-joint to the drive pinion flange. Torque the U-bolt nuts to specification.

4 MAJOR REPAIR OPERATIONS

DISASSEMBLY

1. Place the drive shaft in a vise being careful not to damage it.
2. Remove the snap rings that retain the bearings in the slip yoke and in the drive shaft.
3. Position the tool shown in Fig. 4 on the shaft and press the bearing out of the slip yoke. If the bearing cannot be pressed all the way out of the yoke, remove it with vise grip or channel lock pliers.
4. Reposition the tool to press on the spider to remove the bearing from the opposite side of the yoke.
5. Remove the yoke from the spider.
6. Remove the bearings, nylon thrust bearings and spider from the drive shaft in the same manner.
7. Clean all foreign matter from the yoke area at each end of the drive shaft.

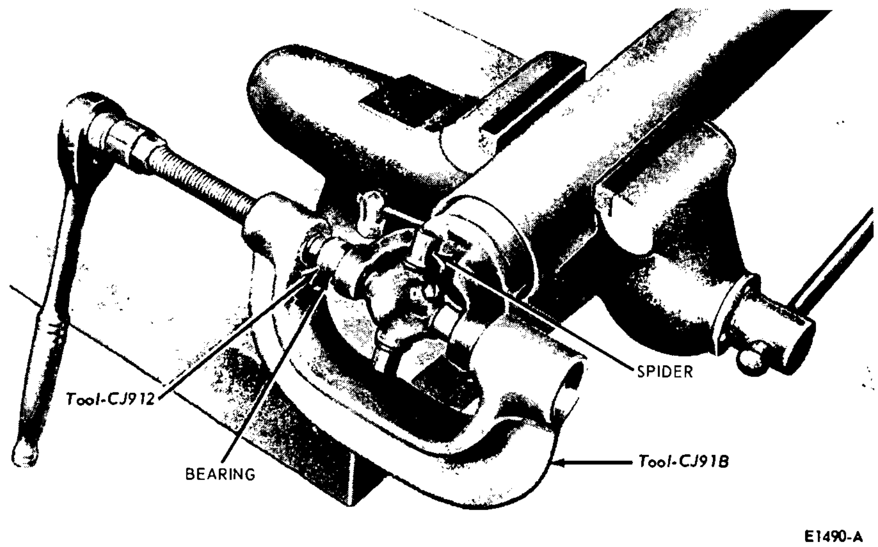


FIG. 5—Installing Universal Joint Bearing

ASSEMBLY

1. Start a new bearing into the yoke at the rear of the drive shaft.
2. Insert the nylon thrust bearings into the end of the spider. Position the spider in the rear yoke and press the bearing 1/4 inch below the surface (Fig. 5).
3. Remove the tool and install a new snap ring.
4. Insert the nylon thrust bearings into the end of the spider. Start a new bearing into the opposite side of the yoke.
5. Install the tool and press on the bearing until the opposite bearing contacts the snap ring.

Remove the tool and install a new snap ring. **It may be necessary to grind the surface of the snap ring to permit easier entry.**

7. Reposition the drive shaft and install the new spider, nylon thrust bearings and two new bearings in the same manner as the rear yoke.
8. Position the slip yoke on the spider and install nylon thrust bearings and two new bearings and snap rings.
9. Check the joint for freedom of movement. If a bind has resulted from misalignment during the foregoing procedures, a sharp rap on the yokes with a brass hammer will seat the bearing needles and usually provide freedom of movement. Care must be taken to support the shaft end during this operation, as well as preventing blows to the bearings themselves. Do not install the drive shaft unless the universal joints are free of bind.

DRIVE SHAFT VIBRATION	Undercoating or other foreign material on shaft. Universal joint U-bolts loose. Universal joints worn, or lack of lubricant. Drive shaft mis-aligned (drive line angle). Drive shaft and axle companion flange 180° out of phase.	Broken rear spring center bolt. Broken rear spring. Rear springs not matched (Sagged to one side). Drive shaft damaged (bent) or out of balance (missing balance weights). Sheared companion flange lugs improper pinion angle.
U - JOINT NOISE	Universal joint U-bolts loose. Lack of lubrication.	Worn U-joints. Worn needle bearings.

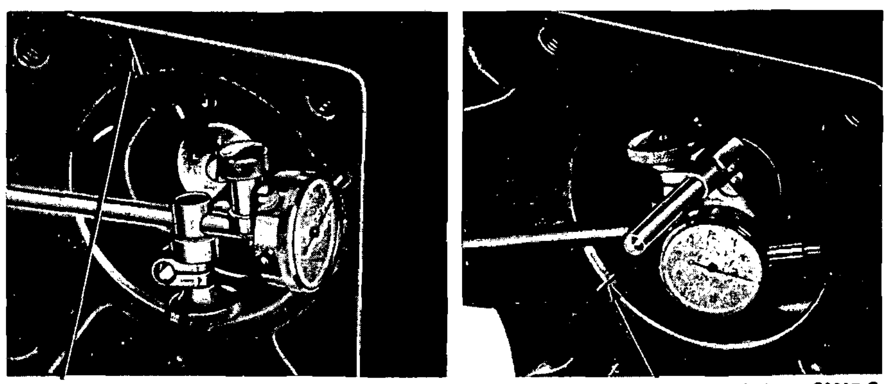
FIG. 6—Drive Shaft Trouble Diagnosis and Possible Causes

PART 5-2— General Clutch Service

1 DIAGNOSIS AND TESTING

Refer to Fig. 6 and 7, Diagnosis Guide—Clutch, for diagnosis information.

2 FLYWHEEL HOUSING ALIGNMENT



MAXIMUM FACE RUN OUT + 0.009 INCH MAXIMUM NEGATIVE BORE RUN OUT 0.015 INCH C1017-C

FIG. 1—Flywheel Housing Alignment Check

Alignment of the flywheel housing bore and rear face with the engine should be checked as a possible cause of any of the following troubles: excessive transmission gear wear, transmission jumping out of gear, especially third gear, drive line vibration, excessive pilot bushing wear, noisy release bearing, or excessive clutch spin time.

INSPECTION

1. With the clutch release bearing removed, install the indicator pilot tool shown in Fig. 1.
2. Clean the faces of the flywheel housing bolt bosses, and remove all burrs, nicks, and paint from the mounting face of the housing.
3. Install the dial indicator on the pilot and adjust the holder so the button will contact a circumference just inside of the transmission mounting holes (Fig. 1).
4. Push the flywheel forward to remove crankshaft end play. Set the dial indicator face to read zero.
5. Remove the spark plugs to alleviate compression.
6. While forcing the flywheel forward, rotate the crankshaft through one revolution and note the point of maximum runout. Mark runout on the face of housing as detailed in Steps 1 and 2 of the Dia-L-Igner instructions (Fig. 2).
7. Position the dial indicator to check bore alignment (Fig. 1). The bore must be clean and free of burrs, nicks and paint.
8. Pull the crankshaft through one revolution. Note the indicator reading and mark the maximum point of runout on the face of the housing as detailed in Steps 3 and 4 of the Dia-L-Igner instructions (Fig. 2).
9. Remove the dial indicator from the crankshaft and the housing.
10. Select the Dia-L-Igner pilot (Fig. 3) which will fit snugly in the bore of the flywheel housing.
11. Press the pilot into place on the locator on the back of the dial.
12. Position the Dia-L-Igner on the face of the housing (Fig. 4) with the pilot in the bore.
13. Rotate the face runout arrow to the positive face runout mark on the housing.
14. Without moving the face runout arrow, route arrow A until it is at the negative bore reading.
15. Slide arrow A to register the amount of bore runout on the—.010 – line of the white scale. Use the scale No. to coincide with the pilot being used.
16. Rotate arrow B until it points in the direction of the face runout arrow and its centerline is parallel to the centerline of the face runout arrow.
17. Determine the amount of the face runout on the B arrow scale.
18. The value of the circular line beneath the amount of face runout will be the desired reading. If the reading is in excess of 0.014 inch the housing alignment is unacceptable.

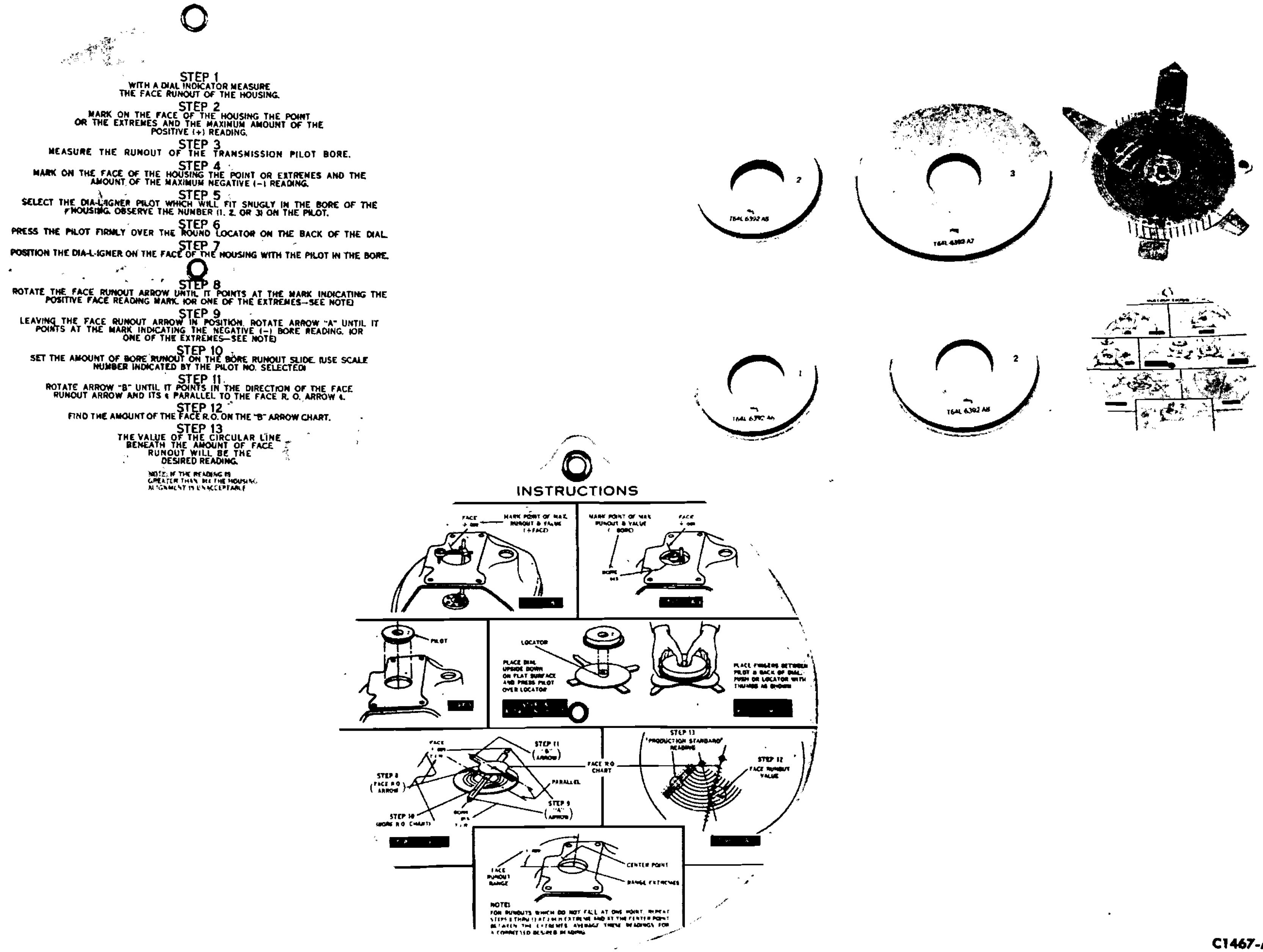


FIG. 2—Dia-L-Igner Guage

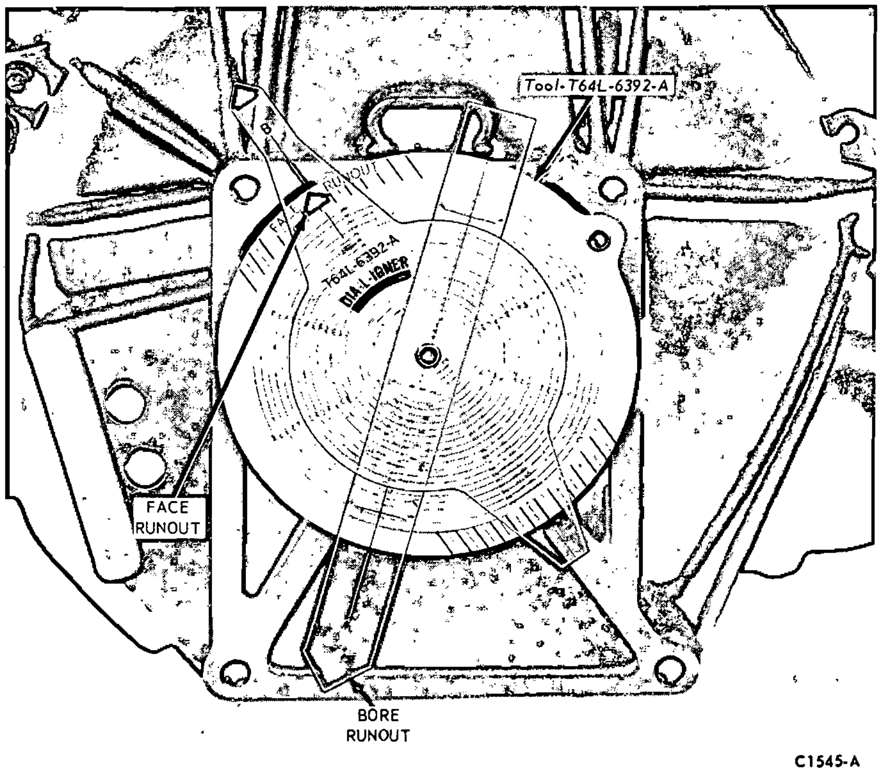


FIG. 3— Dia-L-Igner Guage Installed

19. Remove the Dia-L-Igner gauge from the flywheel housing.

20. Install the spark plugs and connect the wires.

CORRECTION

ENGINE IN VEHICLE

Since any change in face alignment will change bore alignment, it may be possible to correct bore alignment by changing face alignment. Face alignment can be changed by shimming between the flywheel housing and engine. Fig. 4 shows the type of shim which can be fabricated.

Not more than 0.010 inch thickness shims may be used between the flywheel housing and engine. If a 0.010-inch shim will not bring face and bore alignment within limits, replace the flywheel housing.

The shim required is one half the maximum (—) indicator reading, and should be located at the point of maximum minus (—) indicator reading.

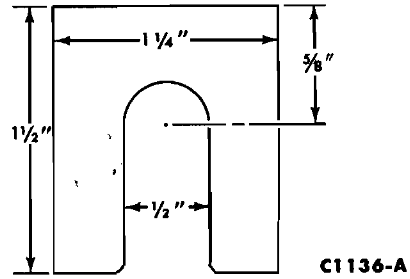


FIG. 4—Fabricated Flywheel Housing Shim

If both the bore and face alignment are out of limits, shim between the flywheel housing and engine to bring face alignment within limits. Check the bore alignment.

If the bore alignment is out of limits and the face alignment is within limits, shim the flywheel housing to the limit of face misalignment and check the bore alignment. If it is not within limits, replace the housing.

ENGINE OUT OF VEHICLE

The same procedure to correct alignment may be used with the engine out of the car or in the car, up to the point of replacing the flywheel housing. If the bore alignment cannot be brought within limits by shimming, follow this procedure:

1. Remove the flywheel housing from the engine and remove the dowel pins. Install the flywheel housing and tighten the attaching bolts.

2. Install the dial indicator (Fig. 1). Check the face alignment, and shim as required to bring face alignment within limits.

3. Position the indicator to check the bore alignment. If the bore alignment is not within limits, reduce the tension on the flywheel housing attaching bolts so that the housing can be moved by striking it with a lead hammer or a block of wood and a steel hammer.

4. The lateral alignment should be brought within limits so that an indicator reading is within limits between the 9 o'clock and 3 o'clock positions on the bore circle. When the lateral alignment is within limits, the housing usually can be moved straight up or down without disturbing the lateral alignment. When alignment is within limits, torque the housing bolts and recheck bore alignment.

5. If the flywheel housing cannot be moved enough to bring the alignment within limits, mark the holes restricting movement, and then remove the housing and drill the marked bolt holes 1/32 inch larger.

6. When the flywheel housing bore alignment is within limits and the attaching bolts are at normal torque, hand ream the dowel pin holes 1/32 inch larger. Use a straight reamer and ream from the flywheel housing side. Oversize dowel pins can be made from drill rod stock.

7. Remove the flywheel housing and then install the oversize dowel pins in the cylinder block. Complete the assembly in the usual way.

8. Recheck the flywheel housing with the Dia-L-Igner gauge to make sure that the housing is within the specified limits.

3 CLEANING AND INSPECTION

RELEASE BEARING

Wipe all oil and dirt off the release bearing. **The bearing is prelubricated and should not be cleaned with solvent.**

Inspect the bearing retainer for loose spring clips and rivets.

Inspect the release bearing assembly for burrs which may cause the assembly to drag on the transmission bearing retainer. Any such burrs should be cleaned up with fine crocus cloth. If burrs are found, inspect the transmission input shaft bearing retainer for evidence of scoring. Any scoring should be polished out with crocus cloth. Coat bearing retainer with a thin film of lithium-base grease C3VY-19586-A. Prior to release bearing installation, apply a light film of lithium base grease (C3VY-19586-A) on both sides of the release lever fork where it contacts the release bearing hub and retaining springs. Apply a light film of grease (C3VY-19586-A) to the release bearing surface that contacts the pressure plate fingers. Carefully fill the grease groove inside the bearing hub with Rotunda Grease (C1AZ-19590-B). Clean all excess grease from the bore of the bearing hub. Excess grease could be forced out by the transmission bearing retainer, contaminating the clutch lining.

Hold the bearing inner race and rotate the outer race while applying pressure to it. If the bearing rotation is rough or noisy, replace the bearing.

Most release bearing failures are caused by improper clutch pedal adjustments. If the clutch linkage does not have enough free travel, the release bearing will constantly touch the release fingers and will spin whenever the engine is running.

When installing a release bearing, use the tool shown in Fig. 5.

Release bearing failure can be caused by the release lever contact points being out of plane. Check the wear on the release bearing assembly where the release lever contacts it.

If one side of the assembly shows more wear than the other, the release lever is bent out of plane, or is not centering on the bracket on the flywheel housing.

Misalignment between the engine and transmission can cause release bearing failure. Other symptoms of misalignment are: transmission jumping out of gear, especially third gear, drive line vibration; excessive wear in the pilot bushing, excessive clutch disc spin time resulting in gear clash, and excessive transmission gear wear.

PRESSURE PLATE AND COVER

Inspect the surface of the pressure plate for burn marks, scores, or ridges. Generally, pressure plate resurfacing is not recommended. However, minor burn marks, scores, or ridges may be removed. During the resurfacing process, the flatness of the pressure plate must be maintained. If the pressure plate is badly heat-checked or deeply scored, replace the pressure plate and cover assembly. Clean the pressure plate and flywheel surfaces with a suitable solvent to be sure the surfaces are free from any oil film. **Do not use cleaners with petroleum base, and do not immerse the pressure plate in the solvent.**

Place the plate on the floor, being careful not to score or scratch the surface. Force each individual finger down, then release it quickly. If the finger does not return quickly, a binding condition is indicated, and the pressure plate should be replaced.

The pressure plate should be lubricated with a lithium-base grease between the driving lugs and the edges of the pressure plate. Depress the pressure plate fingers fully, apply the lubricant, and then move the fingers up and down until the lubricant is worked in. **Do not apply excessive lubricant.**

CLUTCH DISC

Inspect the clutch disc facings for

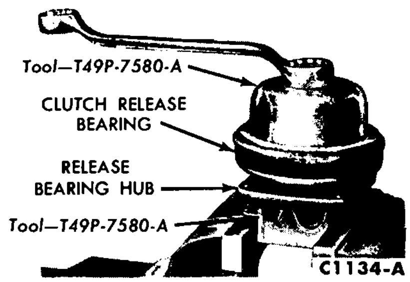


FIG. 5—Installing Clutch Release Bearing or Hub

oil or grease. **Eliminate the source of any oil or grease before replacing the disc.** An excessive amount of grease in the crankshaft pilot bushing or release bearing hub will find its way to the disc facings. Too much lubricant in the transmission or a plugged transmission vent will force the transmission lubricant out the input shaft and onto the disc facings. Also, rear main bearing oil seal leaks or oil leaks from the flywheel mounting bolts can contaminate the clutch disc.

Inspect the clutch disc for worn or loose facings. Check the disc for distortion and for loose rivets at the hub. Check for broken springs. **Springs loose enough to rattle will not cause noise when the car is operating.** Replace the disc assembly if any of these defects are present. **Be especially careful when installing a new disc to avoid dropping it or contaminating it with oil or grease.**

PILOT BUSHING

Check the fit of the clutch pilot bushing in the bore of the crankshaft.

The bushing is pressed into the crankshaft and should not be loose. Inspect the inner surface of the bushing for wear or a bell-mouthed condition. If the bushing is worn or damaged, replace the bushing with a new service bearing. Refer to the applicable engine for the replacement procedure.

TROUBLE SYMPTOMS	POSSIBLE CAUSES	CORRECTION
LOSS OF OR EXCESSIVE CLUTCH PEDAL FREE PLAY AND/OR INADEQUATE RESERVE	1. Clutch linkage out of adjustment. 2. Worn clutch disc. 3. Bent or broken equalizer bar.	1. Adjust clutch linkage. 2-3. Replace worn or defective parts and adjust clutch linkage.
CLUTCH PEDAL HANG UP OR EXCESSIVE CLUTCH PEDAL EFFORT	**CLUTCH** 1. Assist spring not positioned properly. 2. Binding at pedal support bracket, or equalizer rod at firewall. 3. Excessive pedal free travel. **RELEASE BEARING** 1. Lack of lube on transmission input shaft bearing retainer.	1. Install correctly. 2. Lubricate with engine oil or replace support bracket bushing if defective. 3. Adjust clutch linkage. 1. Clean and lubricate retainer with thin coat of Lithium base grease (no Polyethylene).
CLUTCH NOISY WHEN PEDAL IS DEPRESSED TO THE END OF FREE TRAVEL ENGINE RUNNING	1. Release bearing failure due to: A. Improper pedal travel. B. Bearing cocked on hub. C. Release lever to fulcrum bracket spring loose or broken. D. Flywheel housing misalignment. E. Excessive crankshaft end play.	A. Adjust travel to specification. B. Install correctly. C. Check fulcrum plate and return spring. Install correctly. D. Align to specification. E. Repair to specification.
CLUTCH PEDAL ACTUATION NOISY WITH ENGINE OFF	1. Insufficient lubricant on assist spring seats and rollers. 2. Insufficient lubricant and/or contamination on the transmission input shaft bearing retainer. 3. Binding at pedal support bracket or equalizer rod at fire wall.	1. Lubricate linkage and/or spring seats and rollers. 2. Clean and lubricate the bearing retainer with a thin coat of lithium base grease (no polyethylene). 3. Lubricate with engine oil or replace support bracket bushing if defective.
CLUTCH SLIPS OR CHATTERS	1. Incorrect pedal free travel. 2. Worn or contaminated clutch lining. 3. Grease or oil on clutch facings from: A. Release bearing. B. Engine. C. Pilot bearing. D. Transmission.	1. Adjust travel to specification. 2-3. Replace defective parts. (If grease or oil is causing the clutch to slip, replace the disc. Remove the grease or oil from the pressure plate and re-use if it is not burned or scored).
THUD	1. Excessive engine crankshaft end play.	1. Repair to specification.
CLUTCH PEDAL SCRUBBING —ENGINE OFF	1. Pedal push rod rubbing on firewall felt and insulator. 2. Pedal shaft binding at support bracket. 3. Lack of lube on transmission input shaft bearing retainer.	1. Lubricate and check clearance. 2. Lubricate with engine oil or replace support bracket bushing if defective. 3. Clean and lubricate retainer with a thin coat of Lithium base grease (no Polyethylene).

FIG. 6—Diagnosis Guide—Clutch

PART 5-3— Clutch

1 DESCRIPTION AND OPERATION

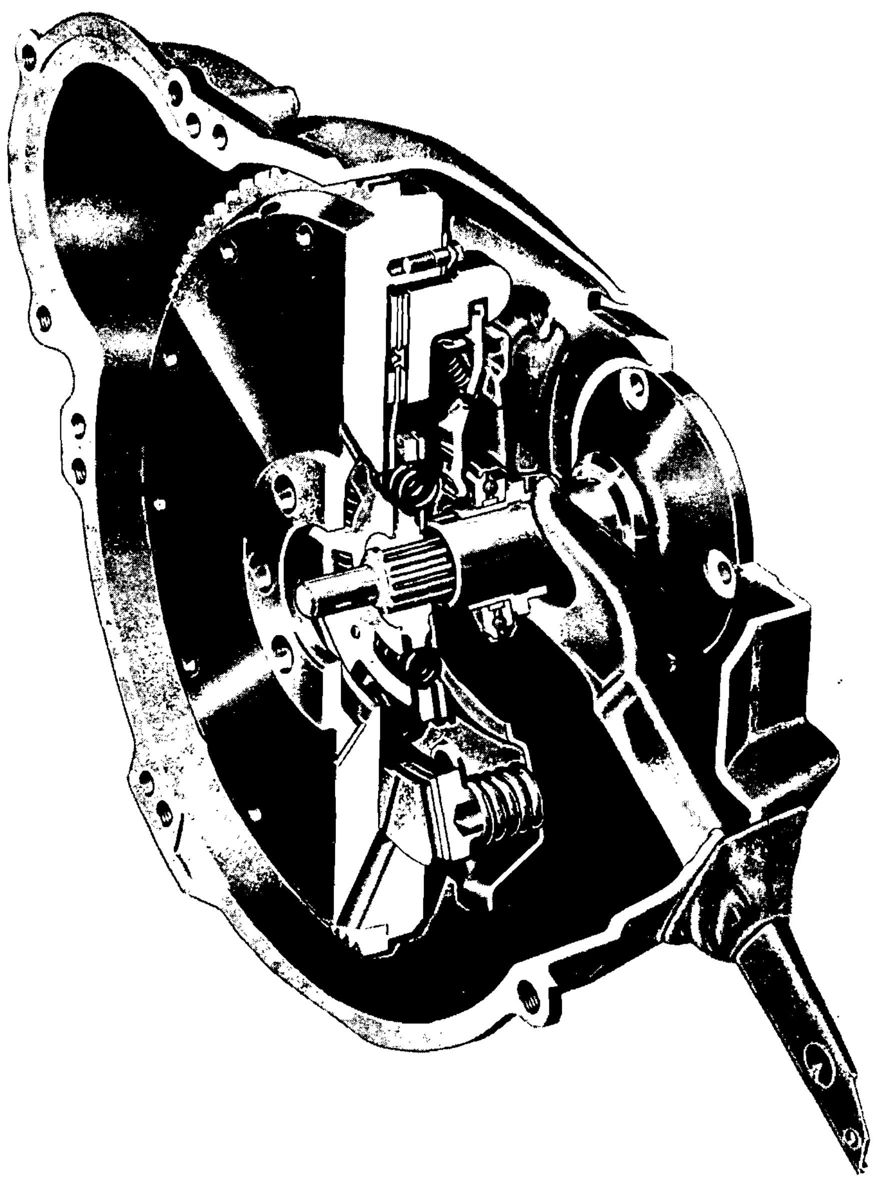
DESCRIPTION

The clutch is of the centrifugal single dry disc type and consists of the clutch disc, pressure plate and the clutch release bearing (Fig. 1).

OPERATION

The clutch is actuated by a clutch pedal and a series of mechanical linkage.

When the clutch pedal is in the engaged position, the clutch disc facings are clamped between the friction surface of the engine flywheel and the face of the clutch pressure plate, thereby connecting engine power to the transmission. Depressing the clutch pedal actuates the clutch release lever which moves the clutch release bearing against the clutch fingers. This, in turn, moves the pressure plate away from the clutch disc. Since the disc is splined to the transmission input shaft, the clutch disc and transmission input shaft will stop when the clutch is disengaged, thereby disconnecting engine power from the transmission.



C1161-B

FIG. 1— Clutch Assembly—Typical

2 IN-VEHICLE ADJUSTMENTS AND REPAIRS

CLUTCH PEDAL ADJUSTMENT

Adjust the clutch pedal free travel whenever the clutch does not disengage properly, or when new clutch parts are installed. **Improper adjustment of the clutch pedal free travel is one of the most frequent causes of clutch failure and can be a contributing factor in some transmission failures.**

FREE TRAVEL

1. Disconnect the clutch return spring from the release lever.

2. Loosen the release lever rod lock nut (Figs 2 and 3).

3. Move the clutch release lever rearward until the release bearing lightly contacts the clutch pressure plate release fingers.

4. Adjust the adapter length until the adapter seats in the release lever pocket.

5. Insert a feeler gauge (0.128 thick for 8 cyl.; 0.178 thick for 6 cyl.) against the back face of the rod adapter. Then, tighten the lock nut (finger tight) against the gauge.

6. Remove the feeler gauge. Hold the lock nut in position and tighten the adapter against the nut. Torque the adapter to specification.

7. Install the clutch return spring.

8. Check the free travel at the pedal for conformance to specification. Readjust if necessary.

9. As a final check, measure the pedal free travel with the transmission in neutral and the engine running at about 3000 rpm. If the free travel at this speed is not a minimum of 1/2 inch, readjust the clutch pedal free travel. Otherwise, the release fingers may contact the release bearing continuously, resulting in premature bearing and clutch failure. **Free travel must be exactly to specification.**

CLUTCH PEDAL AND/OR BUSHING REPLACEMENT

REMOVAL (COMET, FALCON, FAIRLANE)

1. Remove the retaining clip (Fig. 2) that secures the equalizer rod to the clutch pedal. Disconnect the rod from the pedal.

2. Remove the lower bolt retaining the assist spring bracket to the pedal support. Then, loosen the upper bracket retaining bolt (approximately 4 turns) and disconnect the spring

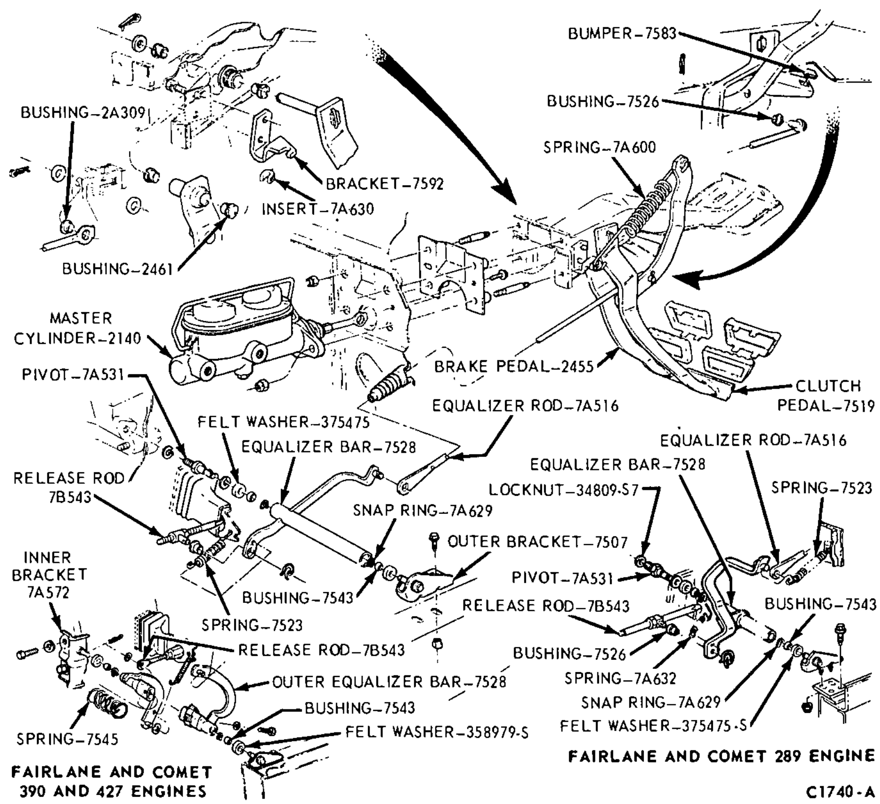


FIG. 2—Fairlane and Comet Clutch Linkage Disassembled

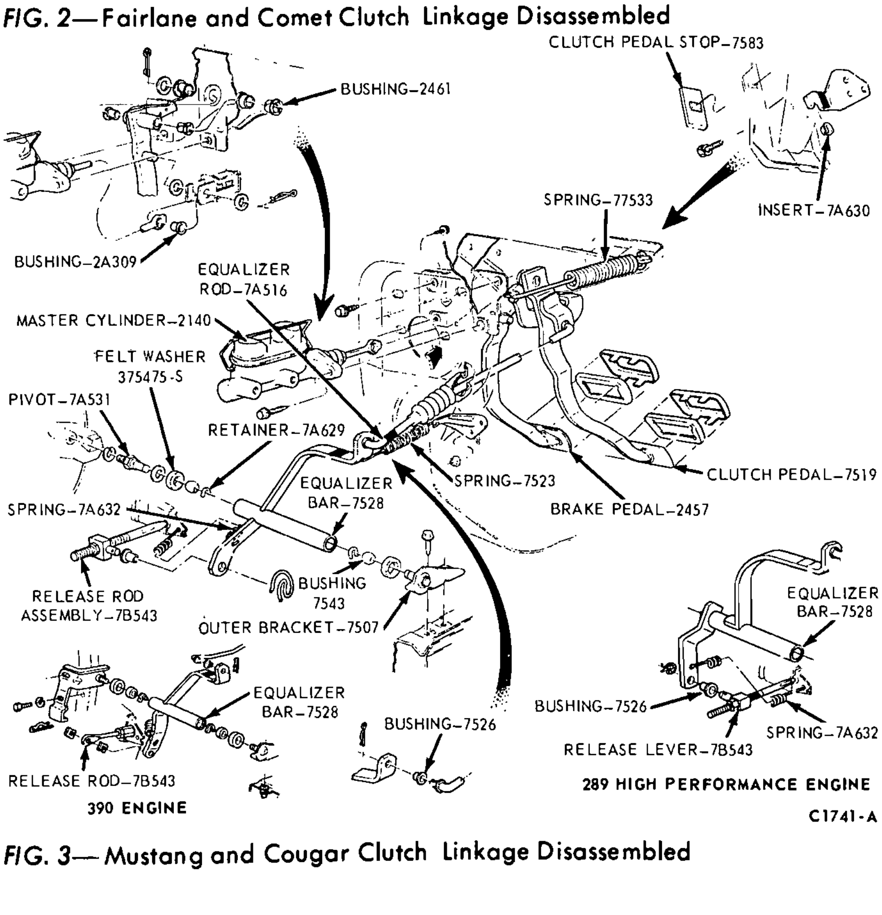


FIG. 3—Mustang and Cougar Clutch Linkage Disassembled

from the clutch pedal and bracket. Do not lose the spring inserts.

3. Disconnect the brake pedal push rod from the brake pedal.

4. Remove the bolt that secures the left air vent control cable bracket to the instrument panel. Position the control cable to one side.

5. Remove the retaining clip and flat washer from the clutch pedal shaft. Then, remove the shaft, bushing, clutch pedal and brake pedal from the support.

6. Remove the bushings from the pedal shaft, and transfer the pedal pad.

INSTALLATION (COMET, FALCON, FAIRLANE)

1. Lubricate the clutch pedal shaft bushings and position them on the shaft. Then, position the brake pedal and clutch pedal in the pedal support.

2. Install the flat washer and retaining clip on the pedal shaft.

3. Position the assist spring to the pedal and bracket. Pry the bracket forward and install the lower bolt. Torque the bolts to specifications.

4. Position the master cylinder push rod, bushing, and washers on the brake pedal and secure with a retaining clip.

5. Connect the equalizer rod to the clutch pedal and secure it in place with a retaining clip.

6. Position the air vent control cable bracket to the instrument panel and secure with the attaching bolt.

7. Adjust the clutch pedal free travel.

REMOVAL (MUSTANG AND COUGAR)

1. Remove the retaining clip (Fig. 3) that secures the equalizer rod to the clutch pedal.

2. Lower the clutch pedal to the floor. **Hold the pedal firmly to prevent it from snapping downward.** Loosen the spring retaining bracket to disconnect the spring from the pedal and the bracket. Do not lose the two inserts.

3. Remove the retaining clip that secures the master cylinder push rod to the brake pedal. Lift the rod and bushings off the brake pedal.

4. Working from the engine compartment, remove the two nuts and flat washers that secure the parking brake mounting bracket to the cowl panel.

5. Remove the two bolts that secure the handbrake and the air vent control cable bracket to the instrument panel. Position these controls to one side.

6. Remove the three bolts that secure the left air vent to the plenum chamber. Remove the air vent and control cable.

7. Remove the retaining clip and flat washer from the right end of the clutch pedal shaft.

8. While supporting the brake pedal, slide the clutch pedal from the mounting bracket.

9. Remove the delrin bushings from the pedals.

INSTALLATION (MUSTANG AND COUGAR)

1. Lubricate the delrin bushings and position them in place.

2. Hold the brake pedal in place, then slide the clutch pedal shaft through the support and the brake pedal. Secure the clutch pedal with a flat washer and the retaining clip.

3. Position the master cylinder push rod and delrin bushings on the brake pedal and secure them with a retaining clip.

4. Install the delrin bushing to the clutch pedal. With the retaining bracket loose and the pedal on the floor, install the spring and torque the spring retaining bracket bolts to specifications.

5. Connect the equalizer rod to the clutch pedal and secure it in place with a retaining clip.

6. Hold the air vent duct in place on the plenum chamber and secure it with the three attaching bolts.

7. Hold the hand brake control and the air vent control cable bracket in place on the lower end of the instrument panel and secure them with the two attaching bolts.

8. Working from the engine compartment, secure the parking brake mounting bracket to the cowl panel with two flat washers and nuts.

9. Check, and if necessary, position the clutch pedal release rod in the clutch release lever.

10. Adjust the clutch pedal free travel as required.

EQUALIZER BAR AND/OR BUSHING REPLACEMENT

COMET, FALCON, FAIRLANE (EXCEPT COMET AND FAIRLANE WITH 390 V-8)

1. Disconnect the clutch pedal equalizer rod at the equalizer bar (Fig. 2).

2. Raise the car and disconnect the return spring at the release lever. Disconnect the release lever rod from the equalizer lever.

3. Remove the equalizer bar center bolt.

4. Separate the equalizer bar and remove both sections from the car.

5. Remove the equalizer bar outer bracket and bushing assembly.

6. Remove the snap ring, bushing, felt washer, and flat washer from the outer bracket and inner pivot.

7. Position a flat washer, felt washer, and bushing on each pivot and secure with the snap ring.

8. Install the outer bracket and bushing assembly to the frame (Fig. 2). Torque the bracket attaching bolts to specifications.

9. Position the outer section of the equalizer bar on the outer bracket pivot.

10. Connect both sections of the equalizer bar and position it on the inner pivot.

11. Install the equalizer bar center bolt and torque to specifications. Make sure that both ends of the equalixer bar are against the felt washers.

12. Connect the release rod and the release lever return spring.

13. Adjust the clutch pedal free travel.

14. Lower the car. Connect the clutch pedal equalizer rod to the equalizer bar and secure with the retaining clip.

15. Check the free travel at the pedal for conformance to specification. Readjust if necessary.

COMET AND FAIRLANE—390 V-8

1. Disconnect the clutch pedal equalizer rod at the equalizer bar (Fig. 2).

2. Raise the car and disconnect the return spring at the release lever. Disconnect the release lever rod from the equalizer lever.

3. Remove the equalizer bar center bolt.

4. Separate the equalizer bar and remove both sections from the car.

5. Remove the bolts retaining the equalizer bar inner bracket to the flywheel housing and remove the bracket and bushing assembly.

6. Remove the equalizer bar outer bracket and bushing assembly.

7. Remove the snap ring, bushing, and felt washer from each bracket assembly.

8. Position a felt washer, and bushing on each bracket assembly and secure with the snap ring.

9. Install the outer bracket and bushing assembly to the frame (Fig. 2). Torque the bracket attaching bolts to specifications.

10. Position the outer section of the equalizer bar on the outer bracket pivot.

11. Connect the two sections of the equalizer bar. Insert the inner bracket pivot into the equalizer bar

and install the assembly to the flywheel housing. Torque the attaching bolts to specifications.

12. Install the equalizer bar center bolt and torque to specifications. Make sure that both ends of the equalizer bar are against the felt washers.

13. Connect the release rod and the release lever return spring.

14. Adjust the clutch pedal free travel.

15. Lower the car. Connect the clutch pedal equalizer rod to the equalizer bar and secure with the retaining clip.

16. Check the free travel at the pedal for conformance to specifications. Readjust if necessary.

MUSTANG AND COUGAR

1. Disconnect the clutch pedal equalizer rod at the equalizer bar (Fig. 3).

2. Raise the car and disconnect the release lever return spring at the lever.

3. Remove the equalizer bar outer bracket and bushing assembly.

4. Remove the release rod from the equalizer bar, and then remove the equalizer bar. Remove the bushing and washers from the inner mounting stud.

5. Position the equalizer bar, washers, inner bushing, and retainer on the inner stud.

6. After positioning the outer bushing, install the outer bracket (with the equalizer bar in place).

7. Connect the release rod and the release lever return spring.

8. Lower the car. Connect the clutch pedal equalizer rod to the equalizer bar and secure with the retaining pin.

9. Adjust the clutch pedal free travel as required.

3 CLUTCH REMOVAL AND INSTALLATION

REMOVAL (170, 200, 289 CID ENGINES)

1. Raise the car on a hoist.

2. Disconnect the drive shaft from the rear U-joint flange. Then slide the drive shaft off the transmission output shaft. Insert appropriate Extension Housing Seal Installation tool over the output shaft and into the extension housing oil seal.

3. Disconnect the speedometer cable from the extension housing.

4. Remove the back-up lamp switch (if so equipped) from the shift linkage control bracket.

5. Disconnect the gear shaft rods from the transmission levers. If the car is equipped with a 4-speed transmission, remove the bolts that secure the shift control bracket to the extension housing.

6. Support the engine with a transmission jack and remove the two nuts securing the transmission rear support to the crossmember.

7. Raise the rear of the engine with the transmission jack. Remove the two nuts, washers, and bolts securing the crossmember to the frame supports. Remove the crossmember.

8. Remove the bolts that attach the transmission to the flywheel housing.

9. Move the transmission rearward until the input shaft clears the flywheel housing, then remove the transmission.

10. Disconnect the clutch release lever return spring from the release lever.

11. Remove the starter cable. Remove the starter motor from the flywheel housing.

12. Remove the bolts that secure the engine rear plate to the front lower part of the flywheel housing.

13. Remove the bolts that attach the flywheel housing to the cylinder block and remove the housing and the release lever as a unit.

14. Loosen the six pressure plate cover attaching bolts evenly to release the spring tension. **If the same pressure plate and cover is to be installed after the clutch is overhauled, mark the cover and flywheel so that the pressure plate can be installed in the same position, to maintain a balanced assembly.**

15. Remove the six attaching bolts while holding the pressure plate cover then, remove the pressure plate and clutch disc.

INSTALLATION (170, 200, 289 CID ENGINES)

1. Hold the clutch disc, and pressure plate and cover assembly in position on the flywheel. Start the cover attaching bolts to hold the pieces in place but do not tighten them. **Avoid dropping the parts or contaminating them with oil or grease.**

2. Align the clutch disc with a clutch arbor as shown in Fig. 4 and torque the six pressure plate cover attaching bolts evenly to specification. Then remove the tool.

3. Make certain that the release bearing and hub is properly installed on the release lever. Coat the bearing retainer outside diameter with a light film of lithium soap-type grease. **Do not lubricate the bearing hub.**

4. Make certain that the flywheel housing and the cylinder block mounting surfaces are clean. Position the flywheel housing on the cylinder block and install the attaching bolts. Torque the bolts to specifications.

5. Seat the clutch release rod in the release lever socket and install

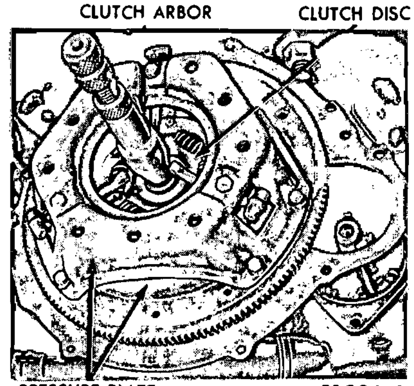


FIG. 4—Installing Clutch Disc

the release lever return spring.

6. Secure the engine rear plate to the front of the flywheel housing with the attaching bolts.

7. Install the starting motor and connect the cable.

8. The mounting surfaces of the transmission and the flywheel housing must be free of dirt, paint, and burrs. Install two guide pins in the flywheel housing lower mounting bolt holes. Move the transmission forward on the guide pins until it is positioned against the flywheel housing.

9. Install the two upper mounting bolts. Then, remove the guide pins and install the two lower mounting bolts. Torque all bolts to specifications.

10. Raise the rear of the engine high enough to provide clearance for installing the crossmember. Install the two crossmember-to-frame support attaching bolts, washers, and nuts. Do not tighten at this time.

11. Align the bolts in the transmission rear support with the bolt holes in the crossmember, then low-

er the engine and remove the jack. Install the two transmission rear support-to-crossmember washers and nuts and torque to specifications. Tighten the crossmember-to-frame support nuts.

12. Connect the gear shift rods to the transmission levers. If the car is equipped with a 4-speed transmission, connect the shift control bracket to the extension housing. Adjust the shift linkage.

13. Install the back-up lamp switch (if so equipped) on the shift linkage control bracket.

14. Remove the tool from the transmission output shaft, and install the drive shaft.

15. Adjust the clutch pedal total travel and free play.

REMOVAL (390 CID ENGINE)

1. Raise the car on a hoist.

2. Disconnect the drive shaft from the rear U-joint flange. Then slide the drive shaft off the transmission output shaft. Insert appropriate Extension Housing Seal Installation tool over the output shaft and into the extension housing oil seal.

3. Disconnect the speedometer cable from the extension housing.

4. Remove the back-up lamp switch (if so equipped) from the shift linkage control bracket.

5. Disconnect the gear shift rods from the transmission levers. If the car is equipped with a 4-speed transmission, remove the bolts that secure the shift control bracket to the extension housing.

6. Support the engine with a transmission jack and remove the two nuts securing the transmission rear support to the crossmember.

7. Raise the rear of the engine with the transmission jack. Remove the two nuts, washers, and bolts securing the crossmember to the frame supports. Remove the crossmember.

8. Remove the bolts that attach the transmission to the flywheel housing.

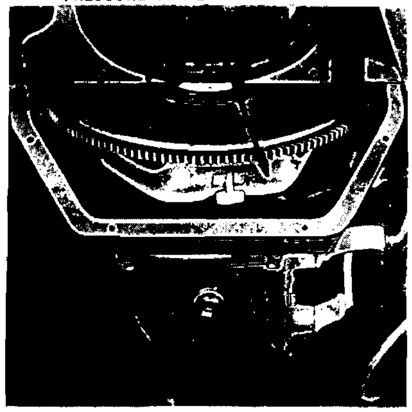


FIG. 5—Clutch Housing — 390 CID Engine

9. Move the transmission rearward until the input shaft clears the flywheel housing, then remove the transmission.

10. Remove the flywheel housing cover.

11. Remove the release lever retracting spring. Then slide the release bearing and hub off the release lever.

12. Loosen the six cover attaching bolts evenly to release the pressure plate spring tension. **If the same pressure plate and cover is to be installed after the clutch is overhauled, mark the cover and flywheel so that the pressure plate can be installed in the same position.**

13. Remove the cover and pressure plate and the clutch disc through the opening at the bottom of the flywheel housing (Fig. 5).

14. Remove the clutch release lever.

INSTALLATION (390 CID ENGINE)

1. Install the clutch release lever.

2. Place the clutch disc, and pressure plate and cover assembly in position on the flywheel. Start the cover attaching bolts to hold the pieces in place but do not tighten them. **Avoid dropping the parts or contaminating them with oil or grease.**

3. Align the clutch disc with the tool shown in Fig. 4, and torque the six cover attaching bolts evenly to specification. Then remove the tool.

4. Place the release bearing and hub on the release lever. Coat the bearing retainer inside diameter with a light film of lithium-soap type grease. **Do not lubricate the bearing hub.**

5. The mounting surfaces of the transmission and the flywheel housing must be free of dirt, paint, and burrs. With the guide pins installed in the two lower mounting bolt holes, move the transmission forward on the guide pins until it is tightly positioned against the flywheel housing.

6. Install the two upper mounting bolts. Then remove the guide pins and install the two lower mounting bolts. Torque all bolts to specification.

7. Raise the rear of the engine high enough to provide clearance for installing the crossmember. Install the two crossmember-to-frame support attaching bolts, washers, and nuts. Do not tighten at this time.

8. Align the bolts in the transmission rear support with the bolt holes in the crossmember, then lower the engine and remove the jack. Install the two transmission rear support-to-crossmember washers and nuts and torque to specifications. Tighten the crossmember-to-frame support nuts.

9. Connect the gear shift rods to the transmission levers. If the car is equipped with a 4-speed transmission, connect the shift control bracket to the extension housing. Adjust the shift linkage.

10. Install the back-up lamp switch (if so equipped) on the shift linkage control bracket.

11. Remove the tool from the transmission output shaft, and install the drive shaft.

12. Adjust the clutch pedal total travel and free play.

PART 5-4— Specifications

CLUTCH IDENTIFICATION—COMET, FALCON, FAIRLANE, MUSTANG, COUGAR

Car Line	Engine	Transmission	Pressure Plate			Disc		
			Diameter (Inches)	No. of Springs	Color Identification (Paint Daub)	Diameter (Inches)	No. of Springs	Color Identification (Paint Daub)
Falcon	200-1V	3-Speed (2.77 Trans.)	9	6	Pressure Plate-Orange Cover - Purple Springs - Aluminum Stripe	9	6	Clutch - Gray Springs - Blue
Falcon	170-1V	3-Speed (3.03 Trans.)	8.5	6	Pressure Plate - Blue Optional Green Cover - Blue Springs - NoColor	8.5	6	Clutch - Yellow Springs - 3 No Color 3 Dark Green
Fairlane Falcon Comet	200-1V	3-Speed (3.03 Trans.)	9	6	Pressure Plate - Orange Cover - Purple Springs - Aluminum Stripe	9	6	Clutch - Pink Springs - Blue
Fairlane Comet	200-1V	3-Speed Heavy Duty	9.38	6	Pressure Plate - White Cover - Black Springs - Bronze	9.38	6	Clutch - Yellow Springs - Blue
Fairlane Comet Falcon	289-2V, 4V	3-Speed 4-Speed	10	9	Pressure Plate - Blue Cover - Purple Springs - Bronze	10	12	Clutch - Purple Springs - Orange
Mustang	200-1V	3-Speed (3.03 Trans.)	9	6	Pressure Plate - Orange Cover - Purple Springs - Aluminum Stripe	9	6	Clutch - Blue Springs - Blue
Mustang Cougar	289-2V, 4V	3-Speed 4-Speed	10	9	Pressure Plate - Blue Cover - Purple Springs - Bronze	10	6	Clutch - Green Springs - Orange
Mustang	289 Hi-Perf.	4-Speed	10.4	9	Pressure Plate - Brown Cover - White Springs - 2 White Stripes	10.4	8	Clutch - 2 Orange Stripes Springs - Gray
Fairlane Comet	390-2V, 4V	3-Speed 4-Speed	11	9	Pressure Plate - Purple Cover - 2 White Stripes Springs - 2 White Stripes	11	8	Clutch - Yellow Springs - Aluminum
Fairlane Comet Mustang Cougar	390-4V GT	3-Speed 4-Speed	11.5	12	Pressure Plate - White & Blue Cover - Pink Springs - Pink Stripe	11.5	8	Clutch - Blue Springs - Aluminum
Fairlane Comet	427-4V, 8V	4-Speed	11.5	12	Pressure Plate - White, Bronze Cover - White Springs - Green	11.5	10	Clutch - White Springs - No Color

TORQUE LIMITS

Description		Ft-Lbs
Flywheel Housing to Cylinder Block Bolts	6-Cylinder	23–33
	8-Cylinder	40–50
Pressure Plate and Cover Assembly to Flywheel Attaching Bolts		12–20
Clutch Release Equalizer Frame Bracket Bolts		25–30
Clutch Pedal Free Travel Adjustment Nut		10–15
Clutch Pedal Assist Spring Bracket to Brake Pedal Support Bracket		12–17

SPECIAL TOOLS

Tool Number	Description
T60K-7657-A or B 7657-C	Transmission Extension Housing Oil Seal Replacer
CJ-91-B	Universal Joint Bearing Replace Tool
T64-L 6392-A	Dia-L-Igner Gauge
T49-P 7580-A	Transmission Clutch Release Bearing Replacer

CLUTCH ADJUSTMENTS

Description	Inches
Clutch Pedal Free Travel (Engine Running)	3/4"-1 1/8"
Clutch Housing Alignment If Dia-L-Igner reading is greater than that indicated, the clutch housing alignment is unacceptable.	0.014
Maximum Shim to Correct Alignment	0.010

Manual Shift Transmissions

GROUP 6

PART 6-1—*General Transmission Service*

1 DIAGNOSIS AND TESTING

The problems related to the transmission usually are: excessive amount of noise, hard shifting efforts, transmission jumps out of gear, gears clash when transmission is shifted from one gear ratio to another, and lubricant leakage.

The vehicle should be road tested, if possible, to determine or confirm complaint. Under normal operating conditions, a large percentage of transmission complaints are due to maladjusted or faulty components outside of the transmission, such as, clutch, clutch linkage, steering columns and shift linkage. Before and during the road test, make sure that the clutch is functioning properly, the shift linkage is properly adjusted, the steering column is properly aligned and, that the transmission is filled to the proper level with lubricant.

The Diagnosis Guide — Transmission (Fig. 5) is compiled as a guide in correcting problems related to manual transmissions. Trouble symptoms, possible causes and corrective measures are listed in the order they should be checked to eliminate all possibility of maladjustment or faulty components outside of the transmission prior to any transmission removal and disassembly. If the transmission was removed, repaired and reinstalled, make certain the clutch and all the gear shift linkage is adjusted to specifications. Road test the vehicle to be sure that the problem has been completely corrected.

To eliminate all possibility of maladjustments or faulty components in the clutch and/or clutch linkage, refer to Clutch Diagnosis and Testing, Group 5 (Driveshaft and Clutch), of the shop manual.

2 COMMON ADJUSTMENTS AND REPAIRS

REAR SEAL REPLACEMENT

1. Remove the driveshaft.
2. Remove the seal from the extension housing with the tool shown in Fig. 1.
3. Install the new seal in the extension housing with the tool shown in Fig. 2.
4. Install the driveshaft.

REAR BUSHING AND SEAL REPLACEMENT

1. Remove the driveshaft from the car.

2. Insert the tool shown in Fig. 3 into the extension housing until it grips the front side of the bushing.
3. Turn the screw clockwise until the seal and the bushing are free of the housing.
4. Drive a new bushing into the extension housing with the tool shown in Fig. 4.
5. Install a new seal in the housing as shown in Fig. 2.
6. Install the driveshaft.

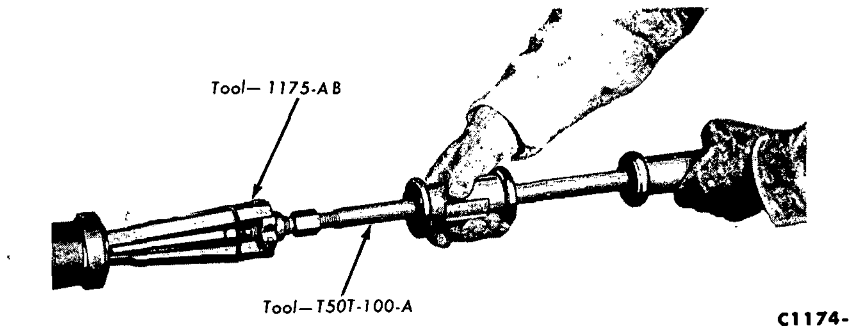


FIG. 1—Removing Extension Housing Seal

LUBRICATION

Lubrication level should be in line with the bottom of filler hole right side of transmission case.

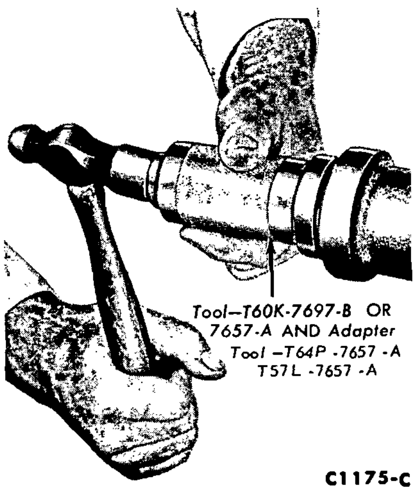


FIG. 2—Install Extension Housing Seal

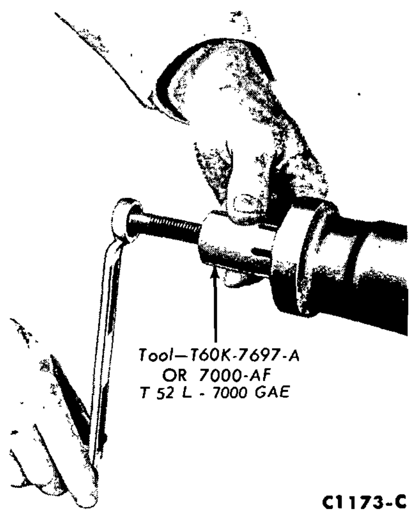


FIG. 3—Removing Extension Housing Bushing and Seal

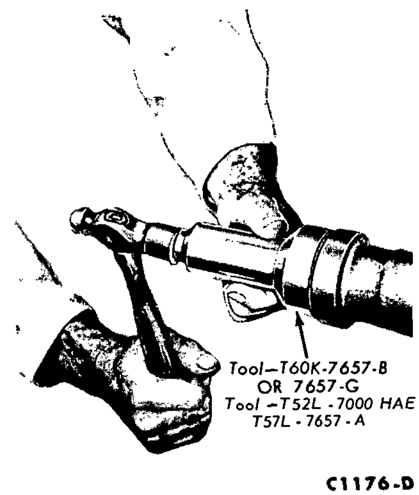


FIG. 4—Installing Extension Housing Bushing

3 CLEANING AND INSPECTION

CLEANING

1. Wash all parts, except the ball bearings and seals in a suitable cleaning solvent. Brush or scrape all foreign matter from the parts. Be carefull not to damage any parts with the scraper. Dry all parts with compressed air. **Do not clean, wash or soak transmission seals in cleaning solvent.**
2. Rotate the ball bearings in a cleaning solvent until all lubricant is removed. Hold the bearing assembly to prevent it from rotating and dry it with compressed air.
3. Lubricate the bearings with approved transmission lubricant and wrap them in a clean, lint-free cloth or paper until ready for use.

INSPECTION

1. Inspect the transmission case for being cracked, worn or damaged bearing bores, damaged threads or any other damage which could affect the operation of the transmission.
2. Inspect the front face of the case for small nicks or burrs that could cause misalignment of the transmission with the flywheel housing. Remove all small nicks or burrs with a fine stone.
3. Replace a cover that is bent or distorted. Make sure that the vent hole in the cover is open.
4. Check the condition of the shift levers, forks, shift rails and the lever and shafts.
5. Examine the ball bearing races for being cracked, worn or rough. Inspect the balls for looseness, wear, end play or other damage. Check the bearings for looseness in the bores.

If any of these conditions exist, replace the bearings.

6. Replace roller bearings that are broken, worn or rough.
7. Replace the countershaft (cluster) gear if the teeth are chipped, broken or worn. Replace the countershaft if it is bent, scored or worn.
8. Replace the reverse idler gear or sliding gear if the teeth are chipped, worn or broken. Replace the idler gear shaft if bent, worn or scored.
9. Replace the input shaft and gear if the splines are damaged or if

the teeth are chipped, worn or broken. If the roller bearing surface in the bore of the gear is worn or rough, or if the cone surface is damaged, replace the gear and the gear rollers.

10. Replace all other gears that are chipped, broken or worn.

11. Check the synchronizer sleeves for free movement on their hubs. Make sure that the alignment marks (etched marks) are properly indexed.

12. Inspect the synchronizer blocking rings for widened index slots, rounded clutch teeth and smooth internal surfaces (must have machined grooves). With the blocker ring on the cone, the distance between the face of the blocker ring and the clutch teeth on the gear must not be less than 0.010 inches.

13. Replace the speedometer drive gear if the teeth are stripped or damaged. Make certain to install the correct size replacement gear.

14. Replace the output shaft if there is any evidence of wear or if any of the splines are damaged.

15. Inspect the bushing and the seal in the extension housing. Replace them if they are worn or damaged. The bushing and/or seal should be replaced after the extension housing has been installed on the transmission.

16. Replace the seal on the input shaft bearing retainer.

17. Replace the seals on the cam and shafts.

TROUBLE SYMPTOMS	POSSIBLE CAUSES	CORRECTION
RATTLE OR BUZZ IN FLOOR SHIFT LEVER	Some floor shift transmissions are subject to shift lever buzz or rattle. No transmission overhaul should be attempted to correct this problem as it is often mistaken for a grating noise in the transmission. **1.** Loose nuts at transmission levers and shift rods. If the nuts are loose, check for bell-mouthing of slots. **2.** Bent transmission shift rods or linkage interference. **3.** Lack of lubrication of shift linkage, trunnions and external shift mechanism (floor shift). **4.** Improperly located console and excessive boot compression (floor shift). **5.** Grommets damaged allowing hold down bolts and/or hold down washers to ground out against lever (floor shift).	**1.** Adjust levers and shift rods to proper crossover, torque nuts to specification. Replace bell-mouthed rods or levers. **2.** Replace bent rods or levers. **3.** Clean and lubricate with Lithium base grease (no Polethylene). **4.** Install correctly. **5.** Replace defective parts. Install correctly.
GEAR CLASH	**CLUTCH LINKAGE** **1.** Lack of clutch pedal reserve, free play and total travel. **2.** Bottoming of clutch release arm in window of clutch housing. **3.** Bent or cracked equalizer bar.	**1.** Adjust to specification. **2.** Grind opening in clutch housing or release arm to provide clearance. **3.** Replace defective parts.
	SHIFT LINKAGE **1.** Improper crossover. **2.** Loose nuts at transmission levers and shift rods. If the nuts are loose, check for bell-mouthing of slots. **3.** Bent transmission shift rods or linkage interference. **4.** Lack of lubrication of shift linkage, trunnions and external shift mechanism (floor shift).	**1-2.** Adjust levers and shift rods to proper crossover, torque nuts to specification. Replace bell-mouthed rods or levers. **3.** Replace bent rods. **4.** Clean and lubricate with Lithium base grease (no Polyethylene).
	CLUTCH **1.** Excessive engine idle speed. **2.** Inadequate clutch pedal reserve resulting in excessive spin time. **3.** Incorrect pedal free travel. **4.** Disc binding on transmission input shaft. **5.** Excessive disc runout. **6.** Flywheel housing misalignment. **7.** Oil or grease on clutch facings from: A. Release bearing B. Engine C. Release lever D. Pilot bearing E. Transmission	**1.** Adjust engine idle rpm. **2.** Adjust clutch linkage to specification. Check for damaged input shaft pilot bearing or excessive clutch disc runout—replace defective parts. **3.** Adjust to specification. **4.** Check for burrs on splines, replace if necessary. **5-7-8.** Replace clutch disc. **6.** Align to specification.

FIG. 5—Diagnosis Guide—Transmissions

Continued on next page

TROUBLE SYMPTOMS	POSSIBLE CAUSES	CORRECTION
GEAR CLASH (Continued)	**8.** Damaged or contaminated clutch lining.	
	TRANSMISSION	
	1. Forward Gear Clash **A.** Weak or broken insert springs in the synchronizer assembly. **B.** Worn blocking rings and/or cone surfaces. **C.** Broken blocking rings. **D.** Excessive output shaft end play. **E.** Shifter fork loose on shift rails. **F.** Binding input shaft pilot bearing (non-synchronized low gear transmission only). **G.** Worn shifter forks or sleeves.	**1. A-B-C-D-F-G** Replace worn or defective parts. **E.** Torque shifter fork set screws to specification.
	2. Reverse Gear Clash (Allow approximately three-four seconds after the clutch pedal has been depressed before shifting into reverse gear). **A.** If gear clash continues after allowing proper time for the clutch plate to stop, check the clutch adjustments to make sure that they are within specifications. **B.** Excessive engine idle speed. **C.** Binding input shaft pilot bearing. **D.** Worn or damaged clutch disc.	**2. A.** Adjust clutch to specification—See possible causes under Clutch for gear clash trouble symtoms. **B.** Adjust engine idler rpm. **C-D.** Replace defective parts.
HARD SHIFTING	**SHIFT LINKAGE**	
	1. Improper crossover. **2.** Loose nuts at transmission levers and shift rods. If the nuts are loose, check for bell-mouthing of slots. **3.** Bent transmission shift rods or linkage interference. **4.** Lack of lubrication of shift linkage, trunnions and external shift mechanism (floor shift). **5.** Improperly located console and excessive boot compression (floor shift).	**1-2.** Adjust levers and rods to proper crossover, torque nuts to specification. Replace bell-mouthed rods or levers. **3.** Replace bent rods or levers. **4.** Clean and lubricate with Lithium base grease (no Polyethylene). **5.** Install correctly.
	STEERING COLUMNS	
	1. Improper column alignment, looseness, binding and worn surfaces. Make certain the toe plate at the base of the column is fastened securely to the firewall. **2.** Worn shift key or broken weld securing shift key to top or bottom of shift tube. **3.** Loose shift lever pin in die cast selector lever hub. **4.** Keyway in die cast selector lever hub pounded out.	**1.** Align column properly, replace defective column parts and fasten toe plate to firewall securely. **2-3-4.** Replace defective parts.

FIG. 5 (Continued)—Diagnosis Guide— Transmissions

Continued on next page

TROUBLE SYMPTOMS	POSSIBLE CAUSES	CORRECTION
HARD SHIFTING (Continued)	5. Alignment of column to steering gear pilot bushing. 6. Loose screws securing die casting to bottom of tube. Excessive radial movement in the column linkage. (If the vehicle has high mileage or is subjected to hard use, even though the crossover has been properly set, the column may have deteriorated to a point where proper crossover engagement will not occur due to excessive radial movement in the column linkage (lost motion). 7. Lack of lubrication at column lower plate.	5. Align properly. 6. Replace defective parts. Tighten screws securely. 7. Clean and lubricate with Lithium base grease (no Polyethylene).
	CLUTCH LINKAGE 1. Loss of clutch pedal reserve, free play and total travel.	1. Adjust to specification.
	TRANSMISSION 1. Excessive shift effort. A. Shift levers, shafts or forks worn or bent. B. Synchronizer worn or broken. C. Shift rail components not functioning properly. D. Worn shifter forks or sleeves. 2. Sticking in Gear. A. Low lubricant level. B. Corroded transmission levers (shaft). C. Defective (tight) input shaft pilot bearing. D. Stuck detent plug. E. Burred or battered teeth on synchronizer sleeve and/or input shaft. F. Shifter fork loose on shift rails.	**A-B.** Replace worn or defective parts. **C-D.** Install correctly, replace defective parts, if necessary. 2. **A.** Fill to bottom of filler plug hole. **B-D.** Free-up and clean parts, replace if necessary. **C-E.** Replace defective parts. **F.** Torque shifter fork set screw to specification.
GEAR JUMPOUT	**SHIFT LINKAGE** 1. Improper crossover. 2. Loose nuts at transmission levers and shift rods. If the nuts are loose, check for bell-mouthing of slots. 3. Bent transmission shift rods or linkage interference. 4. Lack of lubrication of shift linkage, trunnions and external shift mechanism (floor shift). 5. Improperly located console and excessive boot compression (floor shift).	**1-2.** Adjust levers and rods to proper crossover. Torque nuts to specification. Replace bell-mouthed rods or levers. 3. Replace bent rods or levers. 4. Clean and lubricate with Lithium base grease (no Polyethylene). 5. Install correctly.

FIG. 5 (Continued)—Diagnosis Guide—Transmissions

Continued on next page

TROUBLE SYMPTOMS	POSSIBLE CAUSES	CORRECTION
GEAR JUMPOUT (Continued)	**STEERING COLUMNS**	
	1. Improper column alignment looseness, binding and worn surfaces. Make certain the toe plate at the base of the column is fastened securely to the firewall.	1. Align column properly, replace defective column parts and fasten toe plate to firewall securely.
	2. Alignment of column to steering gear pilot bushing.	2. Align properly.
	3. Worn shift key or broken weld securing shift key to top or bottom of shift tube.	3-4. Replace defective parts.
	4. Keyway in die cast selector lever hub pounded out.	
	5. Loose screws securing die casting to bottom of tube. Excessive radial movement in the column linkage. (If the vehicle has high mileage or is subjected to hard use, even though the crossover has been properly set, the column may have deteriorated to a point where proper crossover engagement will not occur due to excessive radial movement in the column linkage (lost motion).	5. Replace defective parts. Tighten screws securely.
	TRANSMISSION	
	1. Transmission misaligned or loose.	1. Align to specification. Torque transmission-to-flywheel housing bolts and flywheel housing-to-engine bolts to specifications.
	2. Bent or worn shift fork, lever and/or shaft.	2-3-5-6-7. Replace worn or defective parts.
	3. Worn input shaft pilot bearing.	
	4. End play in input shaft (bearing retainer loose or broken, loose or worn bearings on input and output shafts).	4. Torque retainer bolts to specification. Replace worn or defective parts.
	5. Detent springs broken.	
	6. Detent notches worn.	
	7. Worn clutch teeth on the respective gear and/or worn clutch teeth on synchronizer sleeve.	
	8. Shifter forks loose on shift rails.	8. Torque shifter fork set screw to specification.
LOCKED IN GEAR	**SHIFT LINKAGE**	
When a complaint of momentary locknut is encountered in transmissions with non-synchronized low - gear, determine whether or not a normal "blockout" condition exists. If a "blockout" condition does exist, the customer should be informed that the transmission gears can-	1. Improper crossover.	1-2. Adjust levers and rods to proper crossover. Torque nuts to specification. Replace bell-mouthed rods and levers.
	2. Loose nuts at transmission levers and shift rods. If the nuts are loose, check for bell-mouthing of slots.	
	3. Bent transmission shift rods or linkage interference.	3. Replace bent rods or levers.

FIG. 5 (Continued)—Diagnosis Guide—Transmissions

TROUBLE SYMPTOMS	POSSIBLE CAUSES	CORRECTION
LOCKED IN GEAR (Continued) not be pulled into mesh because of gear tooth to tooth abutment which can be eliminated by releasing and depressing the clutch pedal again (thus spinning the clutch disc). This will re-index the drive and driven gear teeth and allow the gears to mesh.	**STEERING COLUMN** **1.** Tricking of shift linkage. Make certain that when slowly shifting out of low gear, the low gear shift lever at the transmission is completely out of low gear detent prior to the column shift lever dropping through neutral crossover. If the transmission shift lever is not completely out of low gear detent, the shift interlock in the transmission will prevent engagement of second gear and a lockup condition occurs. **2.** Improper column alignment, looseness, binding and worn surfaces. Make certain the toe plate at the base of the column is fastened securely to the firewall. **3.** Alignment of column to steering gear pilot bushing. **4.** Worn shift key or broken weld securing shift key to top or bottom of shift tube. **5.** Loose shift lever pin in die cast selector lever hub. **6.** Keyway in die cast selector lever hub pounded out. **7.** Loose screws securing die casting to bottom of tube. Excessive radial movement in the column linkage. (If the vehicle has high mileage or is subjected to hard use even though the crossover has been properly set, the column may have deteriorated to a point where proper crossover engagement will not occur due to excessive radial movement in the column linkage (lost motion). Lack of lubrication at column lower plate.	**CORRECTION** **1-2.** Adjust column properly, replace defective parts and fasten toe plate to firewall securely. **3.** Align properly. **4-5-6.** Replace defective parts. **7.** Replace defective parts. Tighten screws securely. Clean and lubricate with Lithium base grease (no Polyethylene).
	TRANSMISSION **1.** Shift rail components not functioning properly. **2.** Gear seizure. **3.** Synchronizer inserts out of position.	**1-3.** Install correctly, replace defective parts. **2.** Replace defective parts.
NOISY IN FORWARD SPEEDS	**1.** Low lubricant level. **2.** Transmission misaligned or loose. **3.** Input shaft bearings worn or damaged. **4.** Output shaft bearing worn or damaged.	**1.** Fill to bottom of filler plug hole. **2.** Align to specification. Torque transmission-to-flywheel housing bolts end flywheel housing-to-engine bolts to specifications. **3-4-5-6-7.** Replace worn or defective parts.

FIG. 5 (Continued)—Diagnosis Guide— Transmissions

Continued on next page

TROUBLE SYMPTOMS	POSSIBLE CAUSES	CORRECTION
NOISY IN FORWARD SPEEDS (Continued)	5. Mainshaft gears worn or damaged. (In any case of scored or broken gears, the mating gears should be checked). 6. Countershaft gear or bearings worn or damaged. 7. Failure of the operator to fully engage the gears on every shift before engaging the clutch and applying engine power. Gear roll-over noise, inherent in manual transmissions, is caused by the constant mesh gears turning at engine idle speed, while the clutch is engaged and the transmission in neutral; and throwout bearing rub are sometimes mistaken for **mainshaft bearing noise.** Gear roll-over noise will disappear when the clutch is disengaged or when the transmission is engaged in gear. Throwout bearing rub will disappear when the clutch is engaged. In the event that a bearing is defective, the noise is more pronounced while engaged in gear under load or coast than in neutral. When complaints of this nature are encountered, it will be necessary to road test the vehicle to determine if bearing noise exists. **Under no circumstances should any transmission rework be attempted to eliminate gear roll-over noise, or throwout bearing rub.**	
NOISY IN REVERSE	1. Reverse idler gear or shaft, worn or damaged. 2. Reverse sliding gear worn or broken.	1-2. Replace worn or defective parts.
LUBRICANT LEAKS	1. Excessive lubricant. 2. Vent plugged. 3. Input shaft bearing retainer loose or cracked, seal or gasket damaged. 4. Worn or damaged extension housing seal. 5. Worn shifter shaft seals. 6. Extension housing bolts not sealed. 7. Expansion plug at front of case not seated properly. 8. Access cover loose or gasket damaged.	1. Drain to bottom of filler plug hole. 2. Free up. 3. Add sealer and torque retainer bolts to specifications. Replace defective parts. 4-5. Replace defective parts. 6-7-8. Add sealer to bolts, and torque to specifications. Replace defective parts.

FIG. 5 (Continued)—Diagnosis Guide— Transmissions

PART 6-2—Model 2.77 Three-Speed Transmission

1 DESCRIPTION AND OPERATION

DESCRIPTION

The 2.77 C.D. three-speed transmission is used in all Falcon models except station wagons with a 170 or 200 C.I.D. engine. The designation 2.77 C.D. is the actual distance between the centerline of the countershaft and the centerline of the input shaft.

An identification plate (Fig. 1) is attached to the upper right extension housing attaching bolt.

A synchronizer is provided for shifting to second and third speeds. Shifts to first and reverse speeds are accomplished with a sliding gear.

Ball bearings support the input shaft and gear and the center of the output shaft. Needle bearings in the input shaft bore support the front of the output shaft. The countershaft gear (cluster gear) also runs on 2 rows of needle bearings. A bronze bushing is used in the reverse idler gear.

A bushing located at the rear of the extension housing supports the rear of the output shaft. The synchronizer and the blocking rings are the conventional tapered ring and straight clutch gear type.

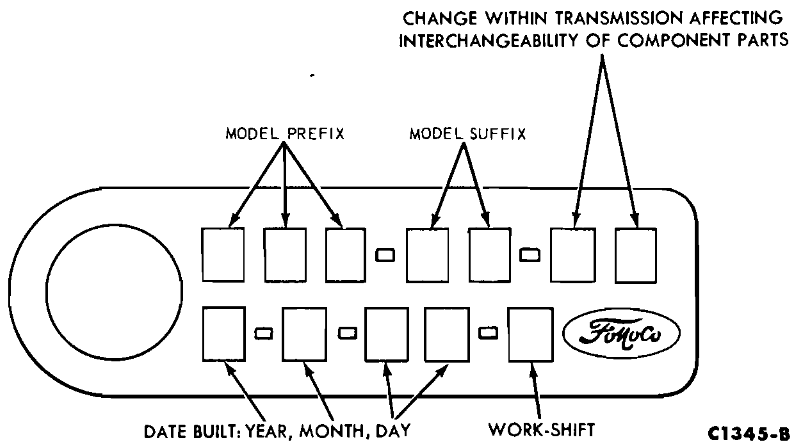


FIG. 1—Transmission Identification Tag

OPERATION

When first gear is selected, the shift lever moves the first and reverse sliding gear into mesh with the low gear on the countershaft (cluster) gear. Power flow is now from the input gear, through the countershaft gear to the first and reverse sliding gear and out through the output shaft.

When second gear is selected, the shift lever moves the second and third speed synchronizer sleeve rearward to force the blocking ring conical surface against the matching cone on the constant mesh intermediate gear located on the output shaft. When the vehicle is moving, as when shifting from low to a higher gear ratio, the internal teeth of the synchronizer sleeve and those on the blocking ring will not index until the intermediate gear is brought up or down to the speed of the synchronizer sleeve which is rotating at output shaft speed.

The synchronizer sleeve with further movement will slide over the blocking ring and engage the clutch teeth on the constant mesh intermediate gear. Since the intermediate gear is now locked to the output shaft by means of the synchronizer sleeve, power flow is from the input shaft through the countershaft gear to the constant mesh intermediate gear to the output shaft.

Engagement of third speed is the same as second except for ratio. In third gear, the clutch teeth on the input shaft are locked directly to the output shaft by the second and third speed synchronizer to provide a ratio of 1:1.

Reverse gear is accomplished by moving the first and reverse sliding gear rearward to engage the reverse idler gear. The drive is then from the input gear, through the countershaft gear, to and through the reverse idler gear to the first and reverse sliding gear which is splined to the output shaft. The gears in this position will rotate the output shaft in a reverse direction.

An interlock pin prevents selection of more than one gear at a time. Detent balls are provided to hold the selected gear in the desired position.

2 IN-VEHICLE ADJUSTMENTS AND REPAIRS

GEAR SHIFT LINKAGE ADJUSTMENT

1. Place the gearshift lever in the neutral position.
2. Loosen the two gearshift rod adjustment nuts.
3. Insert a dealer fabricated special tool in the slot provided in the lower steering column (See Fig. 2). It may be necessary to align the levers to insert the tool.
4. Tighten the two gearshift rod adjustment nuts.
5. Remove the tool from the slot in the steering column.
6. Start the engine and shift the selector lever to each position to make sure it operates freely.

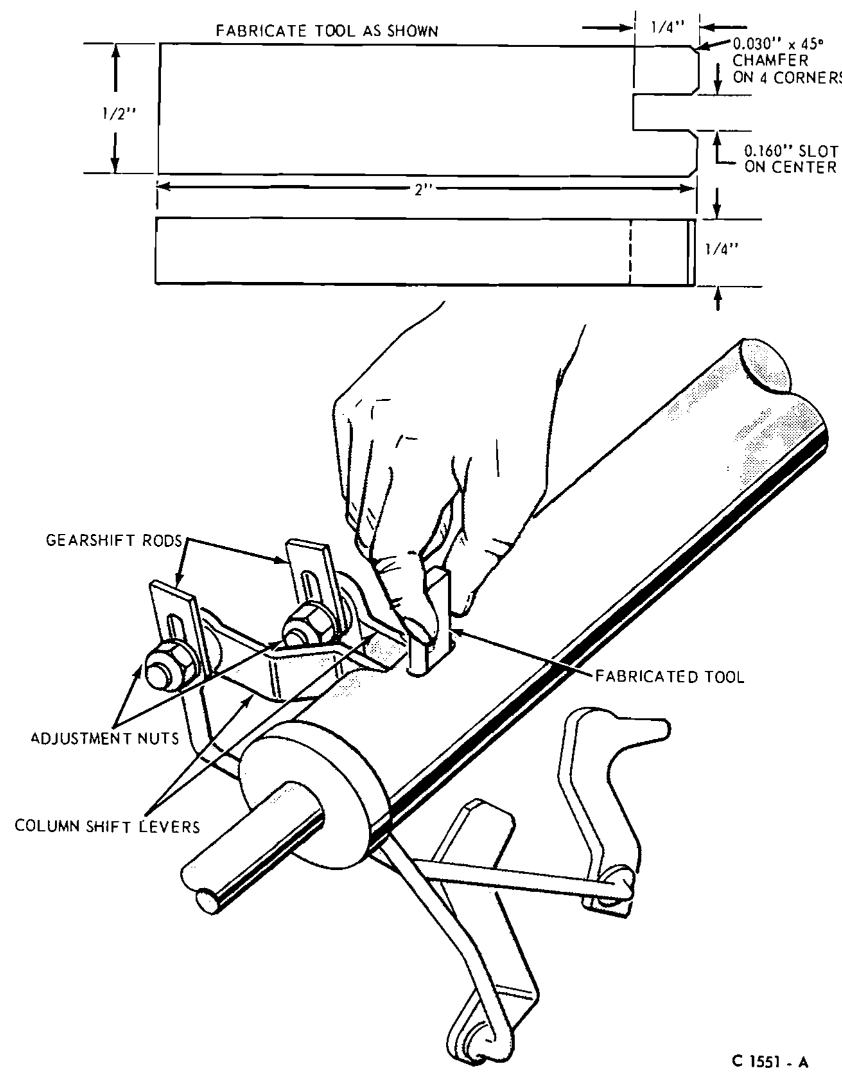


FIG. 2—Falcon Gearshift Linkage Adjustment

3 REMOVAL AND INSTALLATION

REMOVAL

1. Raise the car on a hoist.
2. Remove the driveshaft. Insert the extension housing seal installation tool, Fig. 2, Part 6-1, into the opening of the extension housing to prevent the lubricant from leaking out.
3. Disconnect the speedometer cable from the extension housing, and disconnect the gear shift rods from the transmission shift levers.

On a Mustang, remove the three bolts that attach the shift selector assembly to the extension housing and allow the assembly to hang by the shift lever.

4. Remove the two nuts retaining the transmission rear support to the crossmember.
5. Place a transmission jack under the flywheel housing and raise the rear of the engine slightly.
6. Remove the two cotter pins, nuts, and bolts that attach the crossmember to the frame supports.
7. Disconnect the brake cable from the equalizer lever. Separate the lever from the crossmember.
8. Remove the crossmember from the frame supports and allow it to hang by the brake cable.
9. Move the jack under the transmission. Remove the four transmission to flywheel housing mounting bolts.
10. Move the transmission back just far enough to clear the input shaft and remove it from under the car.

INSTALLATION

1. Install two guide pins in the flywheel housing lower mounting holes. Start the input shaft through the release bearing. Align the output shaft splines with the splines in the

clutch disc. Move the transmission forward on to the guide pins. If the transmission front bearing retainer hangs-up on the release bearing hub, move the clutch release lever to free it.

2. Move the transmission forward until the input shaft is through the clutch hub and enters the pilot bearing.

3. Install the two upper transmission to flywheel housing attaching bolts and lockwashers.

4. Remove the two guide pins and install the two lower attaching bolts. Torque all attaching bolts to specifications.

5. Position the crossmember to the frame supports. Install the equalizer lever and brake cable.

6. Secure the transmission rear support to the crossmember. Secure the crossmember to the frame supports and remove the transmission jack.

7. Connect the gear shift rods and the speedometer cable.

On a Mustang, position the shift selector assembly to the extension housing and install the attaching bolts.

8. Remove the tool (Fig. 2, Part 6-1) from the rear of the extension housing. Install the driveshaft, and torque rear U-bolt nuts to specification.

9. Fill the transmission with approved lubricant. Check the shifting action of the transmission.

10. Adjust the clutch pedal total travel, free travel and shift linkage as required.

4 MAJOR REPAIR OPERATIONS

DISASSEMBLY

1. Mount the transmission in a holding fixture and drain the lubricant.

2. Remove the transmission cover and gasket.

3. Remove the extension housing attaching bolts and remove the extension housing and gasket. To prevent the output shaft from following the housing (with the resultant loss of needle bearings), tap the end of the output shaft with a soft-faced hammer while withdrawing the exten-

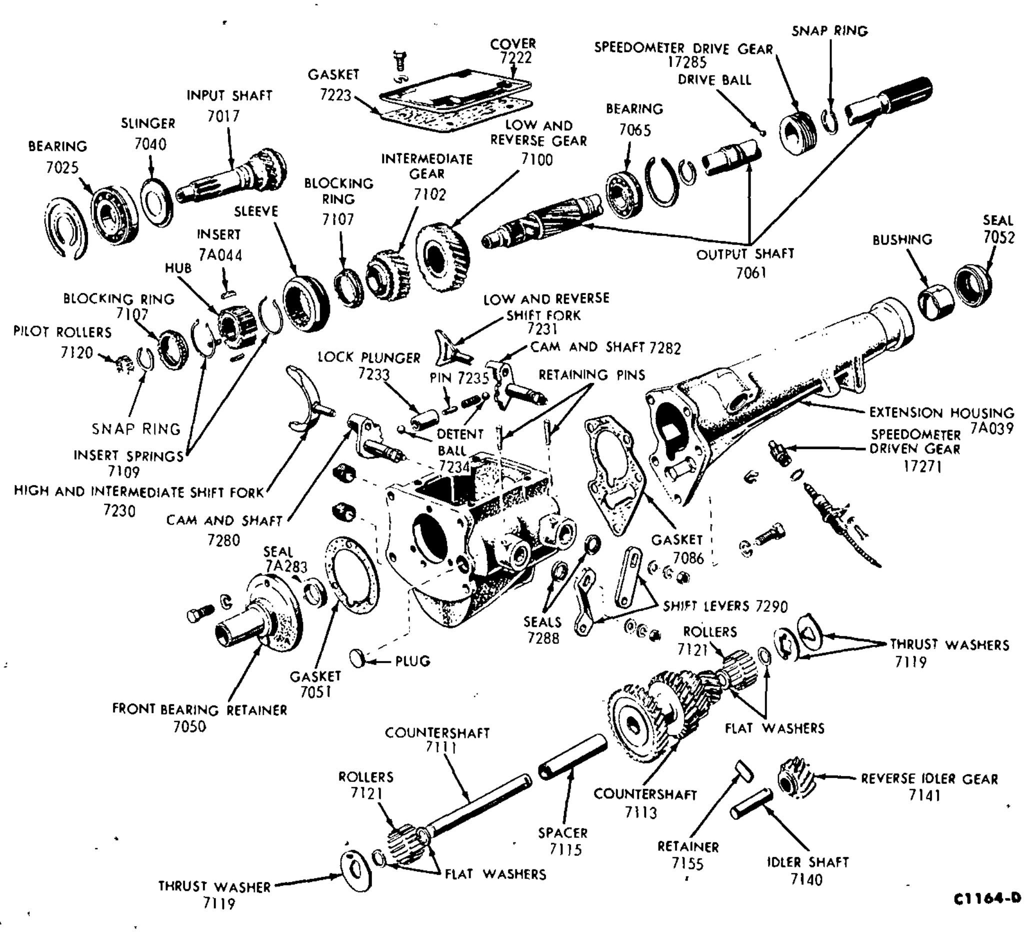


FIG. 3—Transmission Disassembled

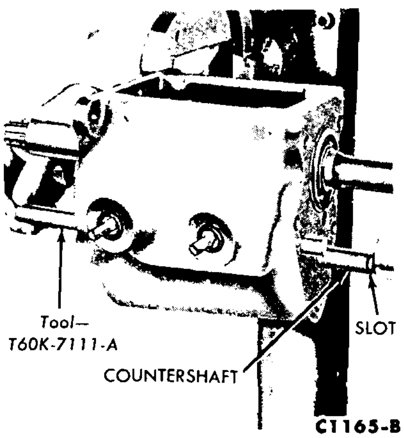


FIG. 4—**Removing or Installing Countershaft**

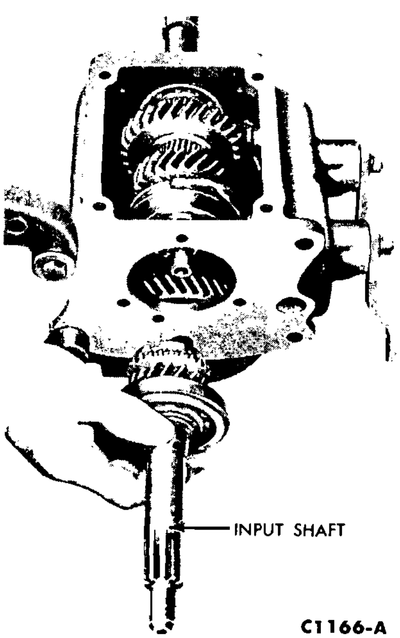


FIG. 5—**Removing Input Shaft**

sion housing. Sec disassembly (Fig. 3).

4. Remove the speedometer drive gear snap ring, the gear, and drive ball from the output shaft.

5. Remove the retainer for the reverse idler shaft and countershaft (Fig. 3).

6. Hold the countershaft gear with a hook and using the tool (dummy shaft) shown in Fig. 4, drive the countershaft rearward out of the countershaft gear and the transmission case. Then, carefully lower the countershaft gear and dummy shaft to the bottom of the case.

7. After removing the input shaft bearing retainer and gasket, remove the input shaft assembly and front synchronizer blocking ring from the transmission case (Fig. 5).

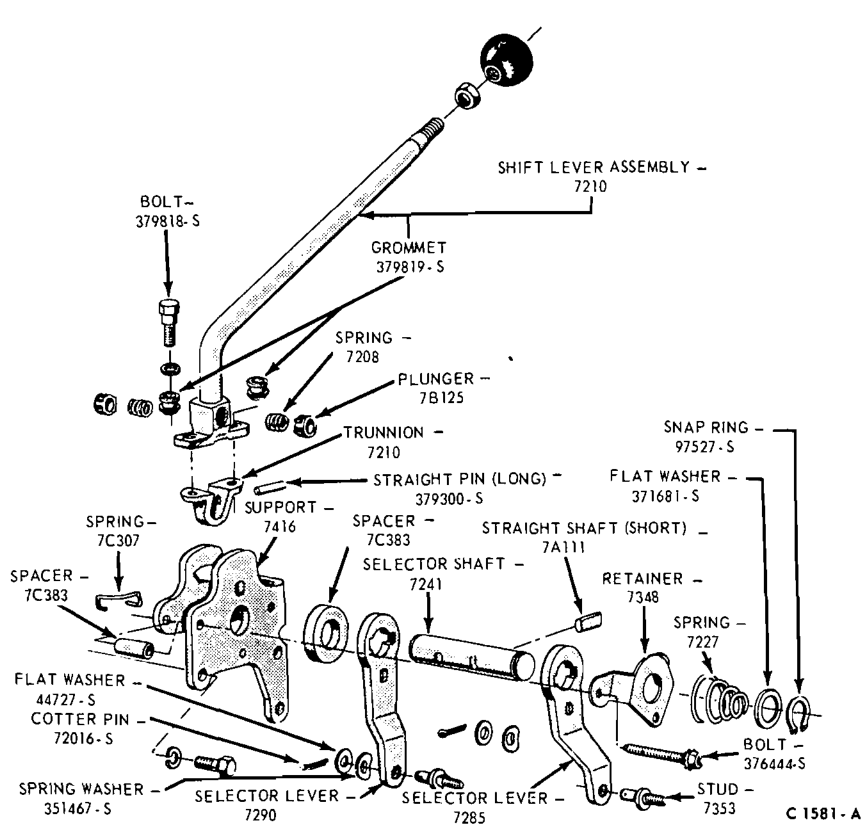


FIG. 6— **Gearshift Lever Disassembled — Typical**

8. Remove the synchronizer retaining snap ring from the output shaft. Then, while holding the synchronizer assembly together, pull the output shaft out of the transmission case. The intermediate gear and the low and reverse gear will slide off the output shaft as it is withdrawn from the case. Lift the synchronizer assembly, intermediate, low and reverse sliding gears out of the case and remove the two shift forks. **For reference in assembly, notice which synchronizer hub end faces forward.**

9. Using a soft drift, drive the reverse idler shaft out of the transmission case. Lift the reverse idler gear and the countershaft gear out of the case.

10. Remove the shift levers.

PARTS REPAIR OR REPLACEMENT

GEAR SHIFT LEVER

1. Remove the snap ring from the end of the selector shaft with pointed snap ring pliers (Fig. 6).

2. Remove the flat washer and spring.

3. After removing two bolts, pull the retainer, selector levers, and spacer from the shaft.

4. Drive the short selector lever pin from the shaft with a large pin punch.

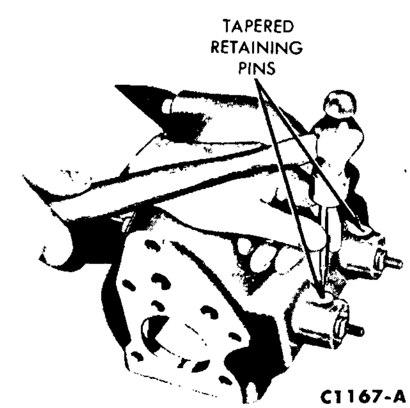


FIG. 7—**Removing Cam and Shaft Retaining Pins**

5. Drive the long trunnion pin from the shaft and remove the trunnion and shaft.

6. If necessary to remove the studs from the selector levers, remove the cotter pins, flat washers, wave washers and studs.

7. Lubricate all mating friction surfaces with Lubriplate before assembly.

8. Install the shaft in the bracket. Position the trunnion and drive the long straight pin through the trunnion and into the shaft until an equal length of the pin is exposed on both sides of the shaft.

9. Drive the short pin into the shaft until the pin is centered in the shaft.

10. Install the levers and spacer on the shaft as shown in Fig. 6.

11. Position the retainer and start the bolts. Before tightening the bolts be sure that the retainer is not interfering with free movement of the shaft. Tighten the bolts.

12. Install the spring, flat washer and snap ring.

13. Install the lever studs if they were removed.

CAM AND SHAFTS AND OIL SEALS

1. From the underside of the case, use a punch to drive out the tapered pins that hold the cam and shaft assemblies in the case (Fig. 7). Use **hard, firm blows.** Using a plastic hammer, drive the intermediate and high cam and shaft toward the inside of the case and separate the detent balls and spring from the plunger. Push out the cam and shaft assemblies, and remove the plunger.

2. If required, the cam and shaft oil seals in the case may be removed with the tools shown in Fig. 8 .

3. Install new seals in the case.

4. Install the reverse and low shift cam and shaft through the case opening. Assemble the spacer and spring in the plunger. Apply grease to each ball and position them in each end of the plunger. Hold the plunger assembly in position and install the intermediate and high cam and shaft in the case opening, allowing the balls to register in the cam detents.

5. Align the cam and shaft grooves with the openings in the shaft bosses in the case, and install the retaining pins. Check the cam action. Bent pins may restrict movement.

INPUT SHAFT BEARING

1. Remove the snap ring securing the input shaft bearing, and press the input shaft out of the bearing and oil slinger.

2. Press the input shaft bearing and oil slinger onto the input shaft with the tool shown in Fig. 9 , and install the snap ring on the shaft.

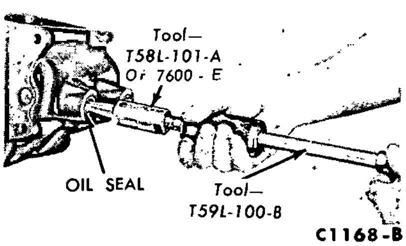


FIG. 8—**Removing Cam and Shaft Oil Seals**

OUTPUT SHAFT BEARING

1. Remove the snap ring securing the output shaft bearing. Remove the bearing as shown in Fig. 10.

2. Press the output shaft bearing onto the shaft as shown in Fig. 10, and install the snap ring on the shaft.

SYNCHRONIZER

1. Remove the synchronizer sleeve, blocking rings, inserts, and retainers from the synchronizer hub.

2. Hold the three inserts in place in the synchronizer hub (Fig. 3).

3. Align the etch mark on the hub with the etch mark on the sleeve. Slip the hub and inserts into the sleeve making sure that the etch marks are aligned.

4. Secure the hub and inserts in the sleeve with the two insert springs.

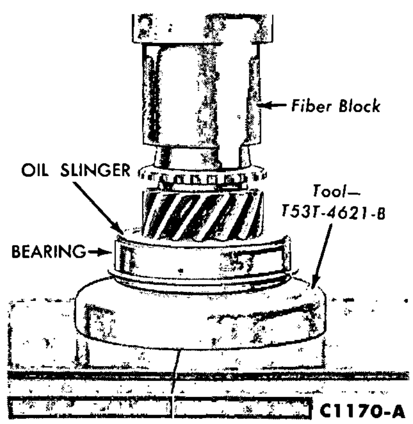


FIG. 9—**Installing Input Shaft Bearing**

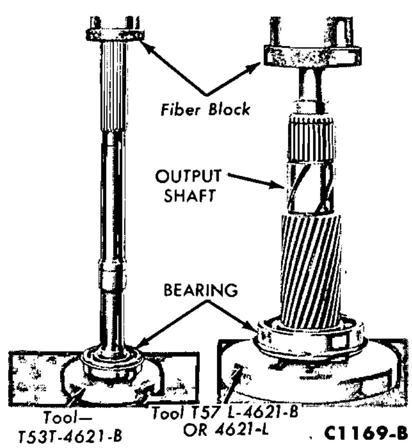


FIG. 10—**Replacing Output Shaft Bearing**

COUNTERSHAFT GEAR BEARINGS

1. Remove the flat washers, dummy shaft, spacer, and roller bearings from the countershaft gear.

2. Insert the spacer and dummy shaft into the countershaft gear. Position one flat washer at each end of the spacer (Fig. 3). Coat the bore in each end of the countershaft with grease and install twenty roller bearings in each end of the gear. Apply a coating of grease to the other two flat washers and the thrust washers and assemble at each end of the countershaft gear. **Note the position of the tangs on the thrust washers.**

3. Place the case in a vertical position. Align the gear bore and thrust washers with the bores in the case and install the countershaft.

4. Place the case in a horizontal position and check the countershaft gear end play with a feeler gauge. The end play should be within specification. If not within these limits, replace the thrust washers.

5. After establishing the correct end play, install the dummy shaft in the countershaft gear and allow the gear to remain at the bottom of the case until the output and input shafts have been installed.

FRONT BEARING RETAINER SEAL

1. Remove the input shaft seal from the front bearing retainer as shown in Fig. 11.

2. Install a new input shaft seal as shown in Fig. 12.

ASSEMBLY

1. If the countershaft gear is not already positioned in the bottom of the case, do it at this time.

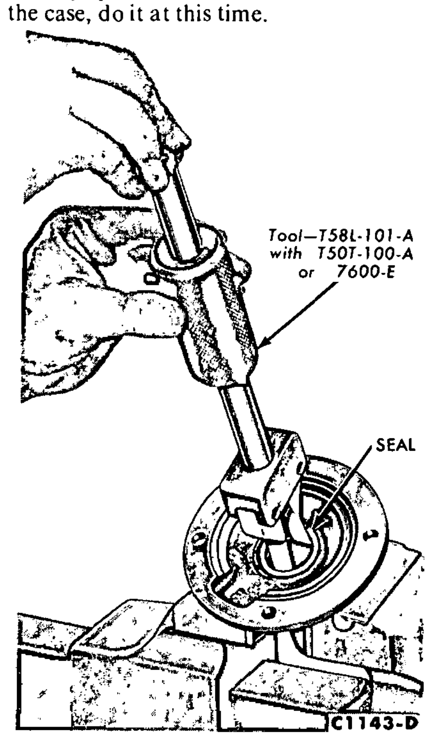


FIG. 11—**Removing Input Shaft Seal**

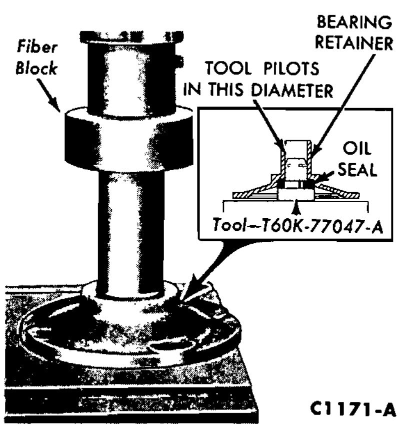


Fig. 12—Installing Input Shaft Seal

2. Position the reverse idler gear, and insert the shaft (from the rear) through the case just far enough to hold the gear.

3. Using a light coat of grease, assemble the needle bearings in the input shaft. **A thick film of grease could plug the lubricant holes and prevent lubrication to the bearings.** Install the front synchronizer blocking ring on the input shaft.

4. Install the shift forks on the cam and shaft assemblies, with the large fork on the intermediate and high cam and shaft. The web of the low and reverse fork must be to the rear of the shaft center.

5. Start the output shaft through the rear opening of the transmission case. Place the low and reverse sliding gear on the shaft, followed by the intermediate gear. Tilt the output shaft enough to allow the rear shift fork to engage the sliding gear groove.

6. With the longer hub end forward slide the synchronizer assembly on to the output shaft and engage the synchronizer sleeve in the intermediate and high shift fork.

7. Install the synchronizer hub snap ring.

8. Position the input shaft and synchronizer front blocking ring in the front of the case seating the output shaft pilot in the roller bearings of the input gear.

9. Place a new gasket on the input shaft bearing retainer. Install the input shaft bearing retainer, using sealer on the bolts. Line up the drain groove in the retainer with the oil hole in the case.

10. Raise the countershaft gear to align the dummy shaft with the countershaft holes in the case. Start the countershaft into the case from the rear, and carefully drive the shaft into position.

11. Install the reverse idler gear shaft and the reverse idler shaft and countershaft retainer.

12. Install the speedometer drive gear and drive ball. Then secure the gear with the snap ring.

13. Install a new gasket, and the extension housing, using sealer on the bolts. Torque the bolts to specification.

14. Install the shift levers.

15. If the extension housing bushing and/or seal is to be replaced, refer to Part 6-1, Section 2, for the detailed instructions.

16. Pour lubricant over the entire gear train while rotating the input or output shaft. Install the transmission case cover and gasket. Use sealer on the bolts. **The gasket vent holes must be toward the rear, and the cover vent hole must be toward the front.**

17. Check transmission operation through all shift positions.

PART 6-3—*Model* 3.03 *Three-Speed Transmission*

1 DESCRIPTION AND OPERATION

DESCRIPTION

The 3.03 RAN Model three-speed transmission (Fig. 1) is used on all cars having a 200 H.D. or 289 C.I.D. engine. A 3.03 RAT Model transmission is used on all vehicles equipped with a 390 C.I.D. engine. The designation 3.03 is the actual distance between the centerline of the countershaft and the centerline of the input shaft.

A transmission service identification tag is located on the right side of the case at the front. The first line on the tag will show the transmission model and service identification code when required. The second line will show the transmission serial number.

This transmission is of the fully synchronized type, with all gears except the reverse gear and sleeve being in constant mesh. All forward-speed changes are accomplished with synchronizer sleeves (Fig. 2) instead of sliding gears. The synchronizers enable quicker shifts, greatly reduce gear clash and permit downshifting, high to intermediate between 40-20 mph and from intermediate to low below 20 mph.

On 6-cylinder models this transmission incorporates a floating countershaft. The countershaft floats in oversize countershaft bores in the transmission case.

The forward-speed gears are helical-cut and are in constant mesh (Fig. 2). Gears used in the reverse gear train are spur-cut and are not synchronized.

Ball bearings support the input shaft and gear and the center of the output shaft (Figs. 12 and 16). Roller bearings in the input shaft bore support the front of the output shaft. The countershaft gear (cluster gear) runs on two rows of roller bearings. Two bronze bushings are used in the reverse idler gear (Figs. 11 and 19). A bushing located at the rear of the extension housing supports the rear of the output shaft.

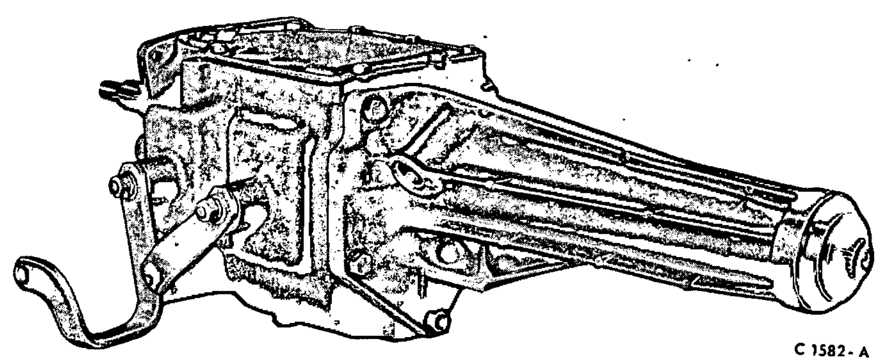


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FIG. 1—3-Speed Transmission

Synchronizers and blocking rings are the conventional tapered ring and straight clutch gear type (Fig. 17).

The shift forks, shift rails, detent mechanism, and related parts are provided in the transmission case (Fig. 9).

OPERATION

When the first-speed gear is selected, the shift lever moves the reverse gear and sleeve forward and forces the synchronizer blocking ring conical surface against the matching cone on the constant mesh first gear located on the output shaft. If the car is moving, the internal teeth of the reverse gear and sleeve and blocking ring will not index until the constant mesh first gear is brought up or down to the speed of the reverse gear and sleeve which is rotating at output shaft speed.

The reverse gear and sleeve has internal splines that, with further movement, will slide over the blocking ring and engage external clutch teeth on the constant mesh first gear. Since first gear is now locked to the countershaft (cluster) gear, the power flow is from the input gear, through the countershaft gear, to the constant mesh first gear, through the reverse gear and sleeve to the output shaft, and out the rear of the transmission.

Engagement of second and third gears is the same as first except for ratio. In third gear, the input gear and shaft is locked directly to the output shaft by the second and third speed synchronizer to provide a ratio of 1:1.

Spur teeth are cut on the outside

of the reverse gear and sleeve. The reverse gear and sleeve like the hub are always locked to the output shaft. Reverse gear is engaged by sliding the reverse gear and sleeve into mesh with the spur gear at the rear of the idler gear. The drive is then from the input gear, through the countershaft gear, to and through the reverse idler gear to the output shaft reverse gear and sleeve. The gears in this position will rotate the output shaft in a reverse direction.

A system of interlocks and detents in the transmission case prevents the selection of more than one gear at a time and helps to hold any gear in the selected position.

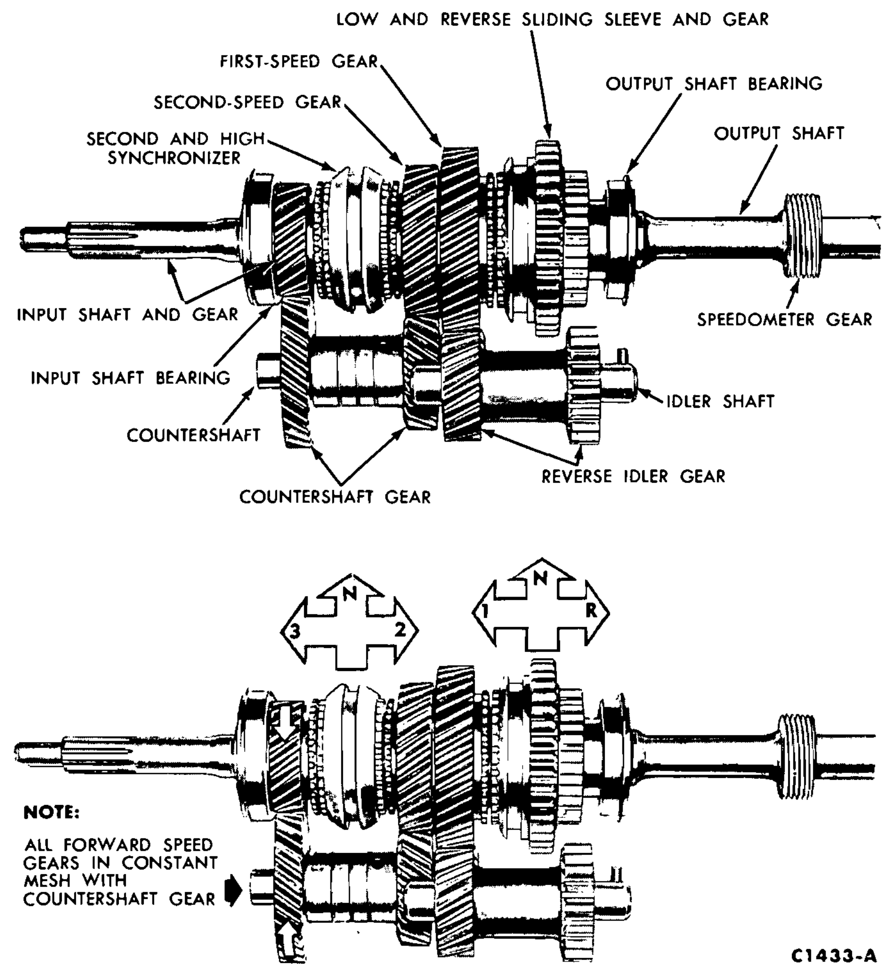


FIG. 2—Power Flow — 3-Speed Transmission

2 IN-VEHICLE ADJUSTMENTS AND REPAIRS

GEAR SHIFT LINKAGE ADJUSTMENT—MERCURY INTERMEDIATE, FALCON, FAIRLANE

1. Place the gear shift lever in the neutral position.

2. Loosen the two gearshift rod adjustment nuts.

3. Insert a dealer fabricated special tool in the slot provided in the lower steering column. (See Fig. 3).

It may be necessary to align the levers to insert the tool.

4. Tighten the two gearshift rod adjustment nuts.

5. Remove the too' from the slot in the steering column.

6. Start the engine and shift the selector lever to each position to make sure it operates freely.

GEAR SHIFT LINKAGE ADJUSTMENT—MUSTANG, COUGAR

1. Loosen the three shift linkage adjustment nuts. Install a 1/4 inch diameter alignment pin through the control bracket and levers as shown in Fig. 4.

2. Tighten the three linkage adjustment nuts and then remove the alignment pin.

3. Check the gear shift lever for a smooth crossover.

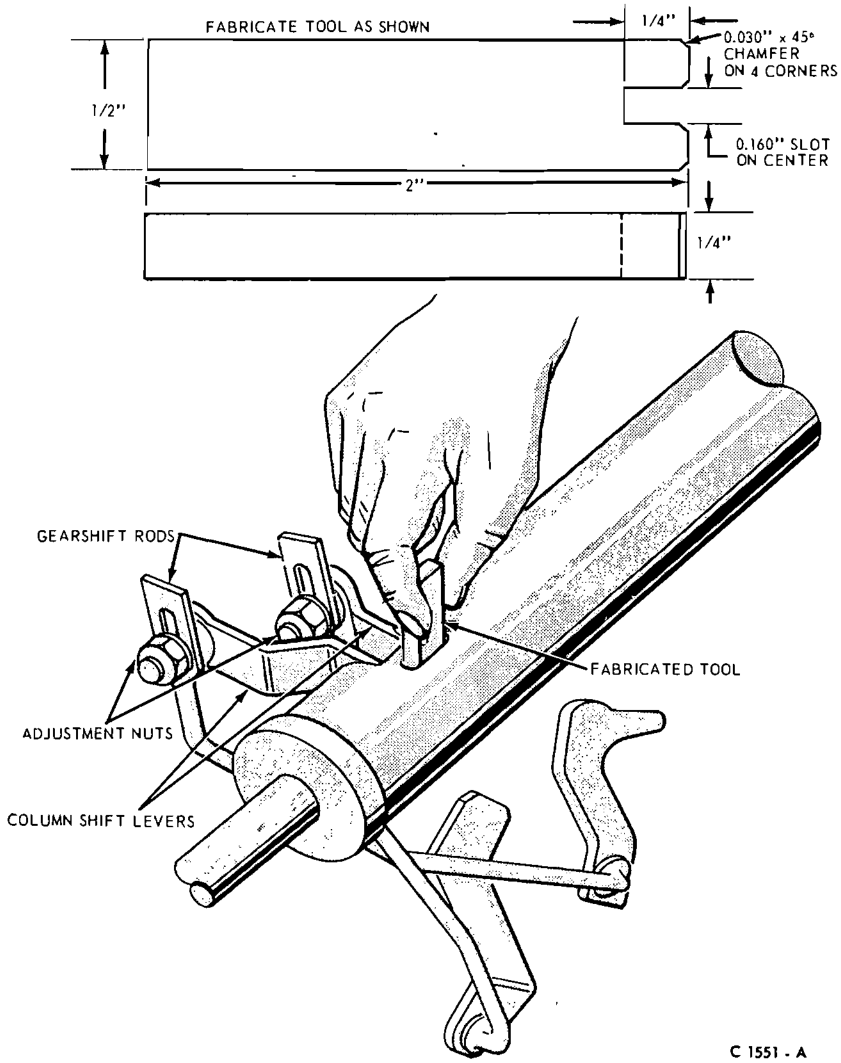


Fig. 3—Mercury Intermediate, Falcon and Fairlane Gearshift Linkage Adjustment

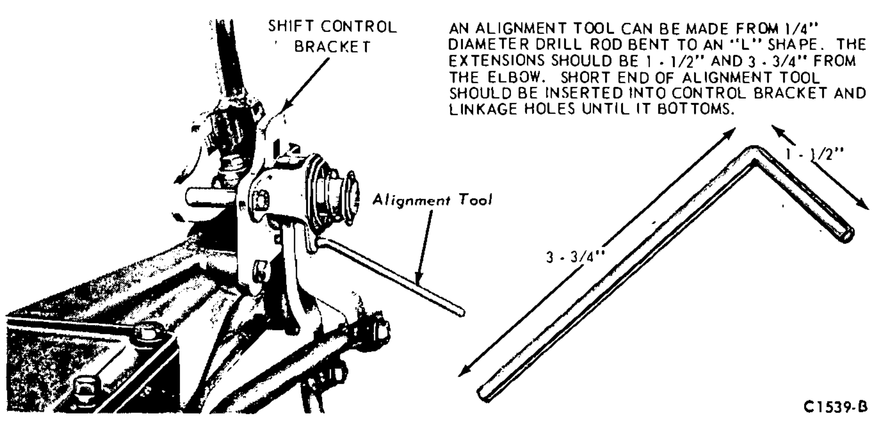


FIG. 4—Three-Speed Shift Linkage Adjustment

3 REMOVAL AND INSTALLATION

REMOVAL

1. Raise the vehicle on a hoist.

2. Disconnect the driveshaft from the rear U-joint flange. Mark the driveshaft so it may be installed in the same relative position.

3. Slide the front of the driveshaft out of the transmission extension housing and off the output shaft. Insert the tool shown in Fig. 2, Part 6-1, to prevent the lubricant from leaking out of the transmission.

4. Remove the cap screw and lock washer that secures the speedometer cable retainer to the extension housing. Pull the speedometer cable out of the extension housing.

5. Remove the cotter pin, flat washer, and spring washer that secure the shift rods to the shift levers on the transmission.

6. On a vehicle equipped with a floor mounted gear shift selector lever, remove the three bolts that attach the shift selector assembly to the extension housing and allow the assembly to hang by the shift lever.

7. Remove the two nuts securing the transmission rear support to the crossmember.

8. Raise the rear of the engine enough to remove the weight from the crossmember. Remove the two nuts, washers and bolts securing the crossmember to the frame supports. Remove the crossmember.

9. Support the transmission with a transmission jack and remove the four flywheel housing-to-transmission case attaching bolts and lock washers.

10. Move the transmission and jack rearward until the input shaft is clear of the flywheel housing.

11. Remove the transmission from under the vehicle. **Do not depress the clutch pedal while the transmission is removed.**

INSTALLATION

1. Make certain that the machined surfaces of the transmission case and the flywheel housing are free of dirt, paint and burrs.

2. Install a guide pin in each lower mounting bolt hole.

3. Start the input shaft through the release bearing. Align the splines on the input shaft with the splines in the clutch disc. Move the transmission forward on the guide pins until the input shaft pilot enters the bearing or bushing in the crankshaft. If the transmission front bearing retainer binds up on the clutch release bearing hub, work the release bearing lever until the hub slides onto the retainer. Install the two transmission-to-flywheel housing upper mounting bolts and lock washers. Remove the two guide pins and install the lower mounting bolts and lock washers. Torque the four mounting bolts to specifications.

4. Raise the rear of the engine high enough to provide clearance for installing the crossmember. Install the two crossmember-to-frame support attaching bolts, washers, and nuts. Do not tighten at this time.

5. Align the bolts in the transmission rear support with the bolt holes in the crossmember, then lower the engine and remove the jack. Install the two transmission rear support-to-crossmember washers and nuts and torque to specifications. Tighten the crossmember-to-frame support nuts.

6. On a vehicle equipped with a floor mounted gear shift selector lever, position the shift selector assembly to the extension housing and install the attaching bolts.

7. Connect each shift rod to its respective lever on the transmission with a spring washer, flat washer, and cotter pin.

8. Insert the speedometer cable and driven gear in the extension housing and secure with a cap screw and lock washer.

9. Remove the tool shown in Fig. 2, Part 6-1, from the extension housing. Slide the front universal joint yoke onto the output shaft and into the extension housing. Connect the rear universal joint to the axle pinion flange and torque the nuts to specifications.

10. Fill the transmission to the proper level with the approved lubricant and lower the car.

11. Adjust the clutch pedal free travel and the shift linkage as required.

4 MAJOR REPAIR OPERATIONS

DISASSEMBLY

1. Mount the transmission in a holding fixture and drain the lubricant.

2. Remove the nine cap screws that attach the cover to the case. Remove the cover and the gasket (Fig. 5) from the case.

3. Remove the five cap screws and lock washers that attach the extension housing to the case. Remove the extension and gasket from the case.

4. Remove the four cap screws and lock washers that attach the front bearing retainer to the case. Remove the retainer and gasket from the case.

5. Remove the lubricant filler plug from the right side of the case.

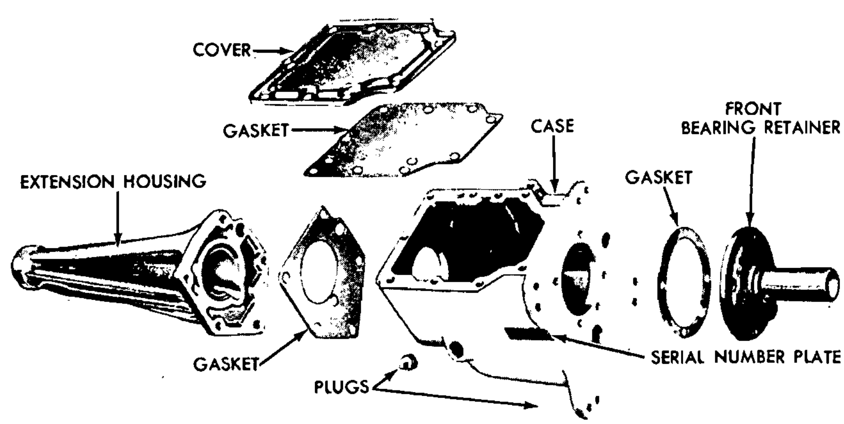


FIG. 5—Transmission Case and Related Parts — Typical

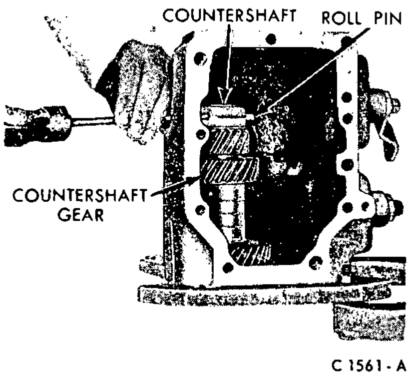


FIG. 6—Removing Countershaft Roll Pin

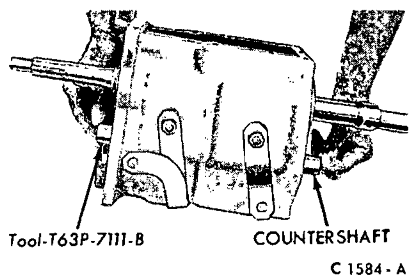


FIG. 7—Removing Countershaft

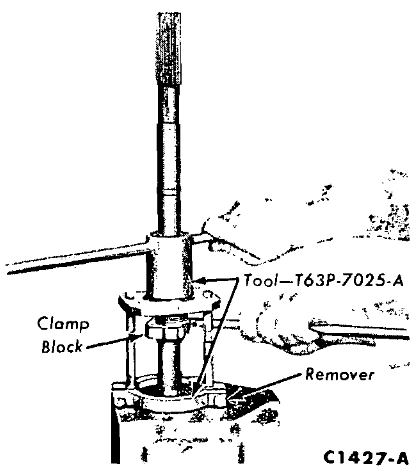


FIG. 8—Removing Output Shaft Bearing

Working through the plug opening, drive the roll pin out of the case and countershaft with a 1/4-inch punch (Fig. 6).

6. On 6-cylinder vehicles with model RAN transmissions, tap the countershaft from the rear of the case with the tool (dummy shaft) shown in Fig. 7 to remove the expansion plug from the countershaft bore at the front of the case.

7. Hold the countershaft gear with a hook and with the tool (dummy shaft) shown in Fig. 7, push the countershaft out the rear of the case.

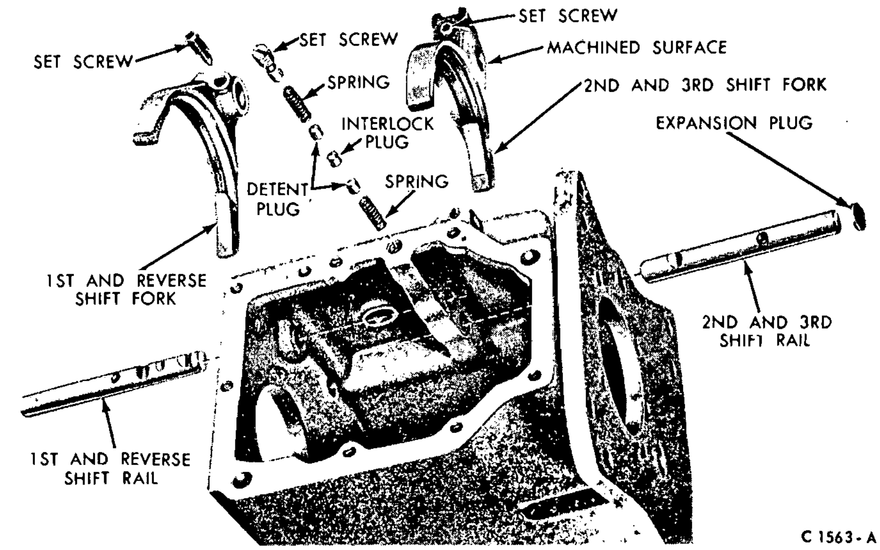


FIG. 9—Shift Rails and Forks— Disassembled

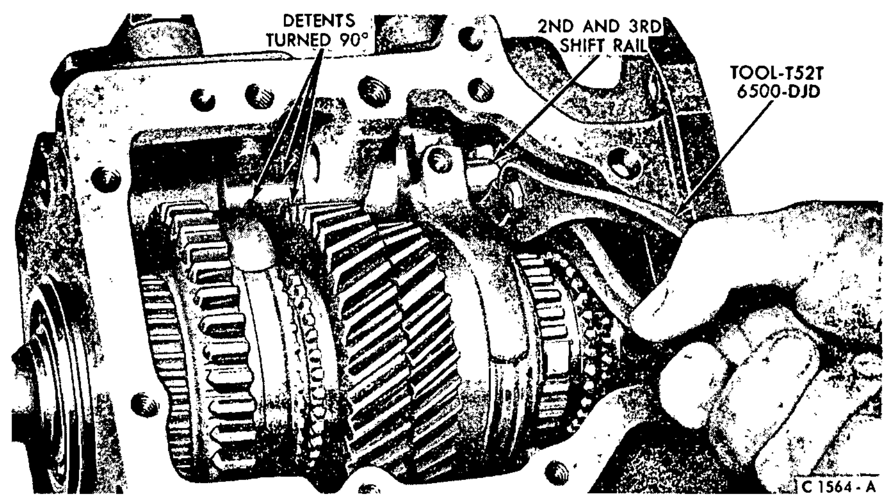


FIG. 10—Rotating Second and Third- Speed Shift Rail

The countershaft (cluster) gear and thrust washers (Fig. 11) can be lowered to the bottom of the case. Remove the countershaft from the rear of the case.

8. Remove the snap ring that secures the speedometer drive gear on the shaft. Slide the speedometer drive gear off the output shaft. Remove the speedometer drive gear lock ball from the shaft.

9. Remove the snap ring that retains the output shaft bearing on the shaft. Remove the bearing from the case and a shaft as shown in Fig. 8.

10. Place both shift levers in the neutral (center) position.

11. Remove the set screw (Fig. 9) that retains the detent springs and plugs in the case. Remove the detent spring and plug from the case.

12. Remove the set screw that secures the first and reverse shift fork to the shift rail. Slide the first and reverse shift rail out through the rear of the case.

13. Slide the first and reverse synchronizer forward as far as possible, then rotate the first and reverse shift fork upward, then lift it from the case.

14. Move the second and third speed shift fork to the second speed position to gain access to the set screw. Remove the set screw from the fork. Rotate the shift rail 90° as shown in Fig. 10.

15. Lift the interlock plug (Fig. 9) from the case with a magnet.

16. Tap on the inner end of the second and third shift rail to remove the expansion plug (Fig. 9) from the front of the case. Remove the shift rail.

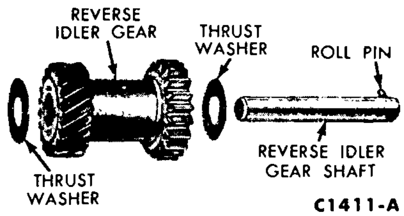


FIG. 11—Reverse Idler Shaft and Gear — Disassembled

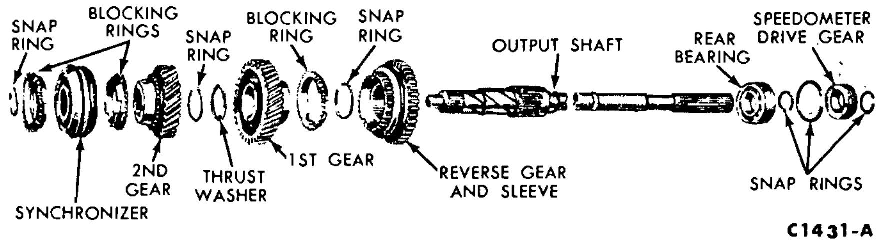


FIG. 12—Output Shaft — Disassembled

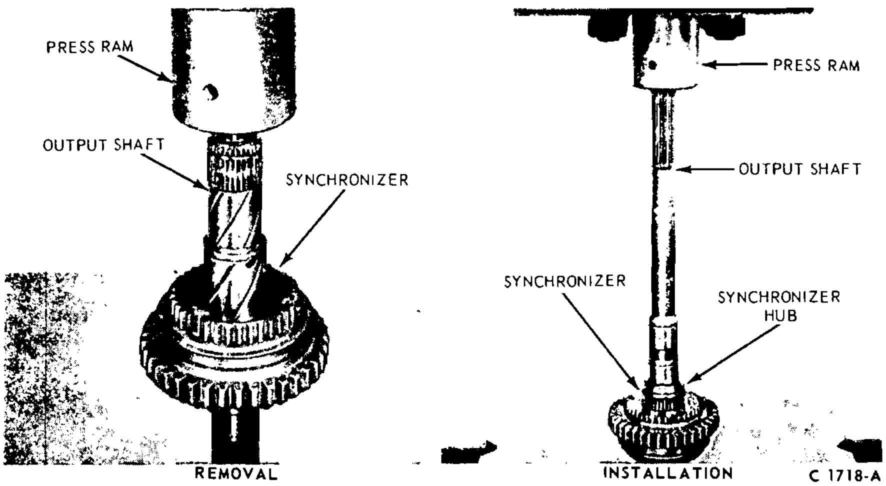


FIG. 13—Removing and Installing First and Reverse Synchronizer

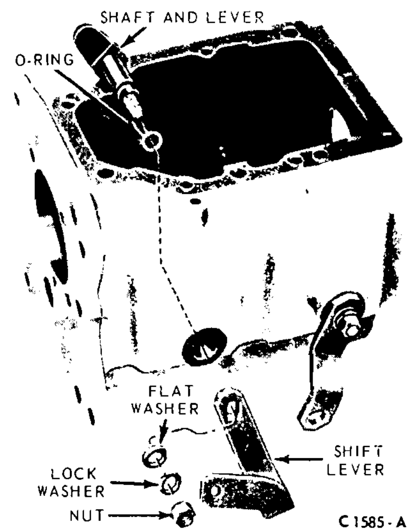


FIG. 15—Shift Lever and Shaft — Disassembled

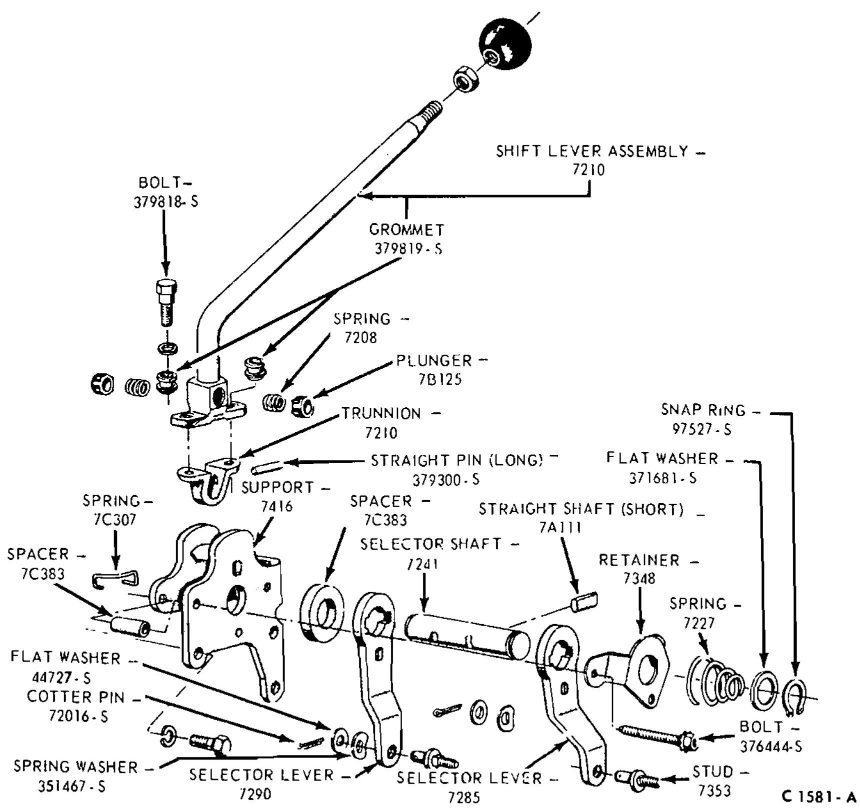


FIG. 14—Gear Shift Lever Disassembled — Typical

17. Remove the second and third detent plug and spring from the detent bore.

18. Pull the input gear and shaft forward until the gear contacts the case, and then remove the large snap ring. It is necessary to move the gear forward to provide clearance when removing the output shaft assembly in RAT models. On RAN models, the input shaft and gear is removed from the front of the case at this time.

19. Rotate the second and third shift fork upward, and lift it from the case.

20. Carefully lift the output shaft assembly out through the top of the case.

On RAT models, work the input shaft bearings and gear back through the bore in the case and out the top.

21. Driving from the front of the case, remove the reverse idler gear shaft from the case and then lift the reverse idler gear and two thrust washers (Fig. 11) from the case.

22. Remove the snap ring from the front of the output shaft, then slide the synchronizers and the sec-

ond speed gear (Fig. 12) off the shaft.

23. Remove the next snap ring and tabbed thrust washer from the output shaft, and then slide the first gear and blocking ring off the shaft.

24. Remove the next snap ring from the output shaft. The first and reverse synchronizer hub is a press fit on the output shaft. To eliminate the possibility of damaging the synchronizer assembly, remove and install the synchronizer hub using an arbor press as shown in Fig. 13. **Do not attempt to remove or install the hub by hammering or prying.**

PARTS REPAIR OR REPLACEMENT

GEAR SHIFT LEVER

1. Remove the snap ring from the end of the selector shaft with pointed snap ring pliers (Fig. 14).
2. Remove the flat washer and spring.
3. After removing two bolts, pull the retainer, selector levers, and spacer from the shaft.
4. Drive the short selector lever pin from the shaft with a large pin punch.
5. Drive the long trunnion pin from the shaft and remove the trunnion and shaft.
6. If necessary to remove the studs from the selector levers, remove the cotter pins, flat washers, wave washers and studs.
7. Lubricate all mating friction surfaces with Lubriplate before assembly.
8. Install the shaft in the bracket. Position the trunnion and drive the long straight pin through the trunnion and into the shaft until an equal length of the pin is exposed on both sides of the shaft.
9. Drive the short pin into the shaft until the pin is centered in the shaft.
10. Install the levers and spacer on the shaft as shown in Fig. 14.
11. Position the retainer and start the bolts. Before tightening the bolts be sure that the retainer is not interfering with free movement of the shaft. Tighten the bolts.
12. Install the spring, flat washer and snap ring.
13. Install the lever studs if they were removed.

SHIFT LEVERS AND SEALS

1. Remove the nut, lock washer and flat washer that secures each shift lever (Fig. 15) to the lever and shaft in the transmission case. Lift the levers off the shafts. Slide each lever and shaft out of the case. Discard the "O" ring from each shaft.
2. Lubricate the new seals with transmission lubricant and install them on the shafts.
3. Install the lever and shafts in the case.
4. Position a shift lever on each shaft and secure them with a flat washer, lock washer and nut.

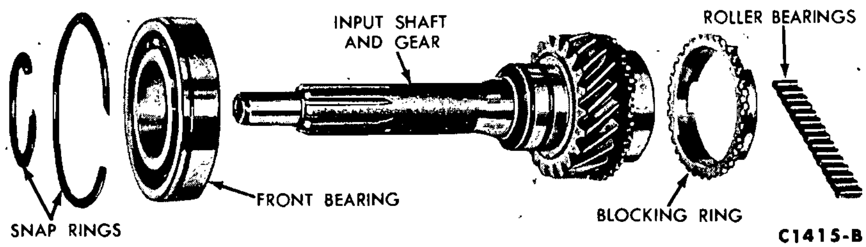


FIG. 16—**Input Shaft Gear — Disassembled**

INPUT SHAFT BEARING

1. Remove the snap ring securing the input shaft bearing (Fig. 16), and press the input shaft out of the bearing.
2. Press the input shaft bearing onto the input shaft with the tool shown in Fig. 17 and install the snap ring on the shaft.

SYNCHRONIZERS

1. Push the synchronizer hub from each synchronizer sleeve.
2. Separate the inserts and insert springs from the hubs. Do not mix the parts from the second and third speed synchronizer with the first and reverse synchronizer (Figs. 18 and 19).
3. Install the rear insert spring (Fig. 20) in the groove of the first and reverse synchronizer hub. Make sure that the spring covers all insert grooves. Start the hub in the sleeve making sure that the alignment marks are properly indexed. Position the three inserts in the hub making sure that the small end is over the spring and that the shoulder is on the inside of the hub. Slide the sleeve and reverse gear onto the hub until the detent is engaged. Install the front insert spring in the hub to hold the inserts against the hub. If square wire insert springs are used, install them so that both spring ends cover the same inserts (Fig. 20). Do not stagger the springs. If round wire springs are used, install them so that the spring humps of the front spring covers different inserts than the spring humps of the rear spring (Fig. 21).

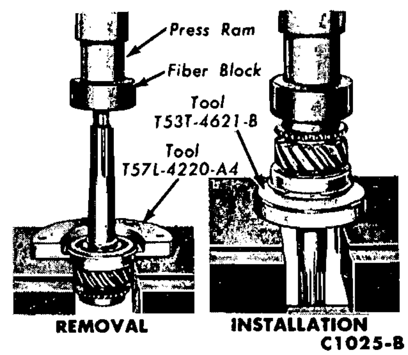


FIG. 17—**Replacing Input Shaft Bearing**

4. Install one insert spring (Fig. 19) into a groove of the second and third speed synchronizer hub, making sure that all three insert slots are fully covered. With the alignment marks on the hub and sleeve aligned, start the hub into the sleeve. Place the three inserts on top of the retaining spring and push the assembly together. Install the remaining insert spring, so that the spring ends cover the same slots as does the other spring. Do not stagger the springs. Place a synchronizer blocking ring on each end of the synchronizer sleeve.

COUNTERSHAFT GEAR BEARINGS

1. Remove the dummy shaft, 50 roller bearings, and the two bearing retainer washers from the countershaft gear (Fig. 22).
2. Coat the bore in each end of the countershaft gear with grease.
3. Hold the dummy shaft in the gear and install the 25 roller bearings and a retainer washer in each end of the gear.
4. Position the countershaft gear, dummy shaft, and roller bearings in the case.
5. Place the case in a vertical position. Align the gear bore and the thrust washers with the bores in the case and install the countershaft.
6. Place the case in a horizontal

position and check the countershaft gear end play with a feeler gauge. The end play should be within specification. If not within these limits, replace the thrust washers.

7. After establishing the correct end play, install the dummy shaft in the countershaft gear and allow the gear to remain at the bottom of the case.

ASSEMBLY

1. Place countershaft gear in proper position at bottom of case. The countershaft gear will remain in the bottom of the case until the output and the input shafts have been installed.

2. Coat the reverse idler gear thrust surfaces in the case with a thin film of lubricant and position the two thrust washers (Fig. 11) in place.

3. Position the reverse idler gear and dummy shaft in place. Align the gear bore and thrust washers with the case bores and install the reverse idler shaft.

4. Measure the reverse idler gear end play with a feeler gauge. End play should be within specification. If the end play is not within limits, replace the thrust washers. If the end play is within limits, leave the reverse idler gear installed.

5. Lubricate the output shaft splines and machined surfaces with transmission lubricant.

6. Slide the first and reverse gear and sleeve (Fig. 12) onto the output shaft with the teeth end of the gear facing toward the rear of the shaft. The first and reverse synchronizer hub is a press fit on the output shaft. To eliminate the possibility of damaging the synchronizer assembly, install the synchronizer hub using an arbor press as shown in Fig. 13. **Do not attempt to install the hub by hammering or prying.** Secure it in place with the snap ring.

7. Place the blocking ring on the tapered machined surface of the first gear.

8. Rotate the gear as necessary to engage the three notches in the blocking ring with the synchronizer inserts. Secure the first gear with the thrust washer and snap ring.

9. Slide the blocking ring onto the tapered machined surface of the second gear. Slide the second gear with blocking ring and the second and third gear synchronizer onto the mainshaft. The tapered machined surface of the second gear must be toward the front of the shaft. Make sure that the notches in the blocking ring engage the synchronizer inserts. Secure the synchronizer with a snap ring.

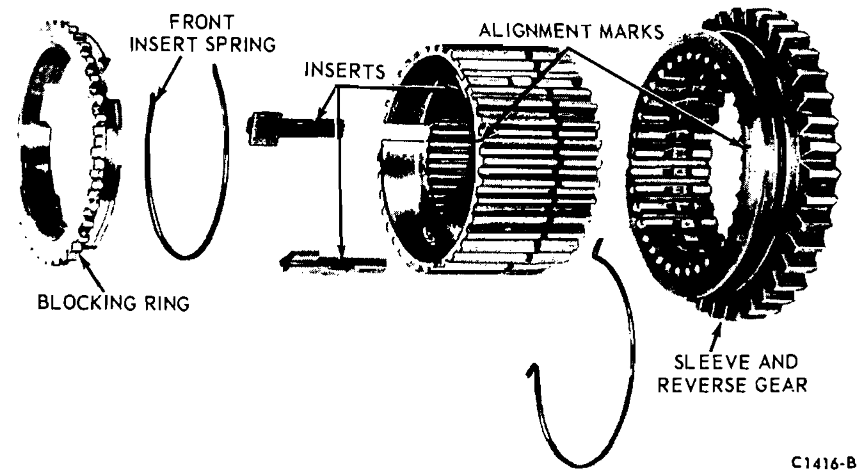


FIG. 18—First and Reverse Synchronizer — Disassembled

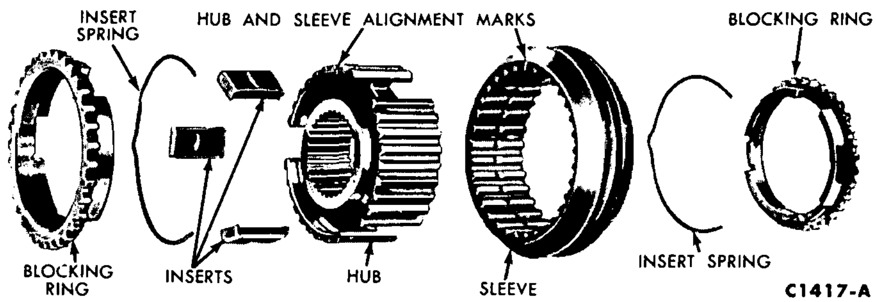


FIG. 19—Second and Third Synchronizer — Disassembled

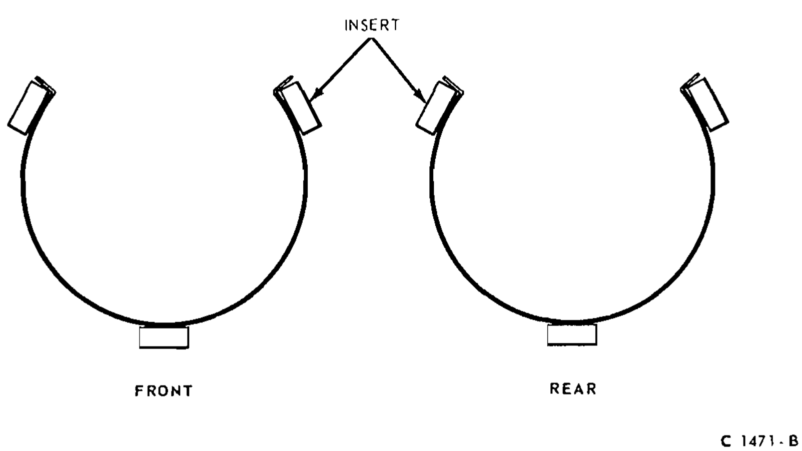


FIG. 20—First and Reverse Speed Synchronizer Insert Spring Instllation—Square Wire Spring

10. Coat the bore of the input shaft and gear with a thin film of grease. **A thick film of grease will plug the lubricant holes and prevent lubrication to the bearings.** Install the bearings (Fig. 16) in the bore.

If working on an RAT model transmission, install the input gear and bearing through the top of the case and through the bore in the front of the case. On RAN models, the input shaft is installed through the front of the case. Install the snap ring in the bearing groove.

11. Position the output shaft assembly in the case. Position the second and third shift fork on the second and third speed synchronizer.

12. Place a detent plug spring and a plug in the case (Fig. 9). Place the second and third speed synchronizer in the second speed position (toward rear of transmission). Align the fork and install the second and third speed shift rail. It will be necessary to depress the detent plug to enter the rail in the bore. Move the rail inward until the detent plug engages the forward notch (second speed position).

13. Secure the fork to the shaft with the set screw. Move the synchronizer to the neutral position.

14. Install the interlock plug in the case. If the second and third shift rail is in the neutral position, the top of the interlock will be slightly lower than the surface of the first and reverse shift rail bore.

15. Move the first and reverse synchronizer forward to the first speed position. Place the first and reverse shift fork in the groove of the first and reverse synchronizer. Rotate the fork into position and install the first and reverse shift rail. Move the rail inward until the center notch (neutral) is aligned with the detent bore. Secure the fork to the shaft with the set screw. Install the remaining detent plug and spring. Secure the detent spring with the slotted head set screw. Turn the set screw to specification.

16. Install a new expansion plug in the case.

17. Hold the input shaft and blocking ring in position, and then move the output shaft forward to seat the pilot in the roller bearings of the input gear.

18. Tap the input gear bearing into place in the case while holding the output shaft to prevent the roller bearings from dropping. Install the front bearing retainer and new gasket, making sure that the oil return slot is at the bottom of the case. Install and torque the four attaching screws to specification.

19. Install the large snap ring on the rear bearing. Place the bearing on the output shaft with the snap ring end toward the rear of the shaft. Press the bearing into place with the tool shown in Fig. 23. Secure the bearing to the shaft with a snap ring.

20. Hold the speedometer drive gear lock ball in the detent and slide the speedometer drive gear into place. Secure the gear with a snap ring.

21. Place the transmission in the vertical position. Working through the drain hole in the bottom of the case, align the bore of the countershaft gear and the thrust washers with the bore of the case with a screwdriver.

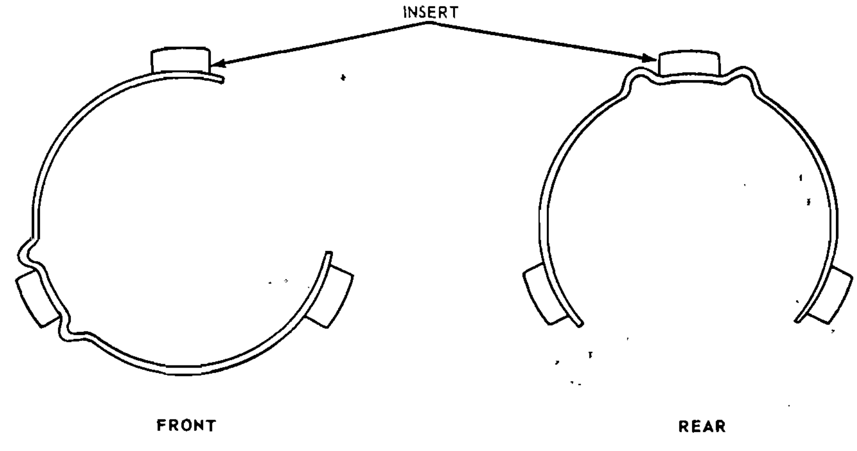


FIG. 21—**First and Reverse Speed Synchronizer Insert Spring Installation — Round Wire Spring**

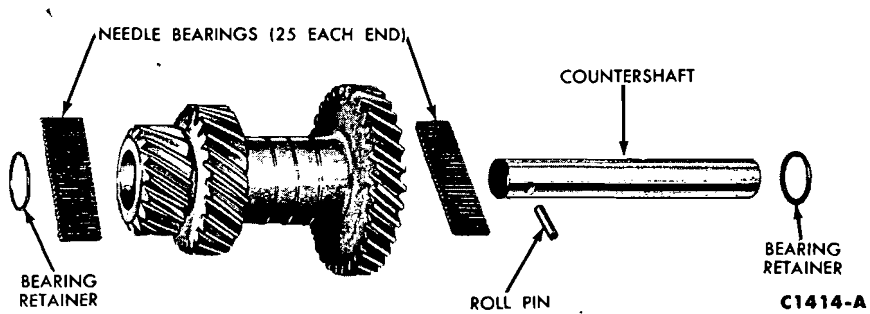


FIG. 22—**Countershaft Gear — Disassembled**

22. Working from the rear of the case, push the dummy shaft out of the countershaft gear with the countershaft. Before the countershaft is completely inserted in the bore, make sure that the hole that accomodates the roll pin is in alignment with the hole in the case. Push the countershaft into place and install the roll pin. On 6-cylinder vehicles with model RAN transmissions, install a new expansion plug in the countershaft bore at the front of the case.

23. Coat a new extension housing gasket with sealer and position it on the case.

24. Install lock washers on the five attaching screws. Dip the threads of the cap screws in sealer. Secure the housing to the case and torque the cap screws to specification.

25. Install the filler and drain plugs in the case. Make sure that the magnetic plug is installed in the bottom of the case.

26. Place the transmission in gear. Pour lubricant over the entire gear train while rotating the input or output shaft.

27. Coat a new cover gasket (Fig. 5) with sealer. Secure the cover with nine cap screws. Torque the screws to specification.

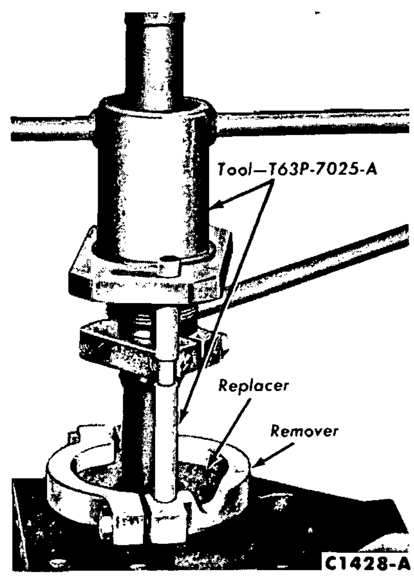


FIG. 23—**Installing Output Shaft Rear Bearing**

28. Check the operation of the transmission in all of the gear positions.

PART 6-4—Ford Design Four-Speed Transmission

1 DESCRIPTION AND OPERATION

DESCRIPTION

The Ford designed 4-speed transmission (Fig. 1) is of the fully synchronized type with all gears except the reverse sliding gear being in constant mesh. All forward-speed changes are accomplished with synchronizer sleeves. The synchronizers will enable quicker shifts, greatly reduce gear clash, and permit down-shifting into any forward-speed gear while the vehicle is moving.

The shift linkage is mounted directly on the transmission extension housing (Fig. 1) and enters the driver's compartment through an opening in the floor pan. A flexible rubber dust boot (Fig. 3) is provided to seal the driver's compartment from the exterior.

The shift pattern is shown on the top of the gear shift lever knob. A finger-operated release lever is provided on the shift lever to prevent the transmission from being accidentally shifted into reverse gear. All forward-speed gears in the transmission are helical-type, however, the reverse sliding gear and the exterior of the first- and second-speed synchronizer sleeve are spur-type gears. The specifications of this section Part 6-6, lists the transmission model numbers and vehicles in which they are used.

A transmission service identification tag is located on the right side of the case at the front. The first line on the tag will show the transmission model and service identification code when required. The second line will show the transmission serial number.

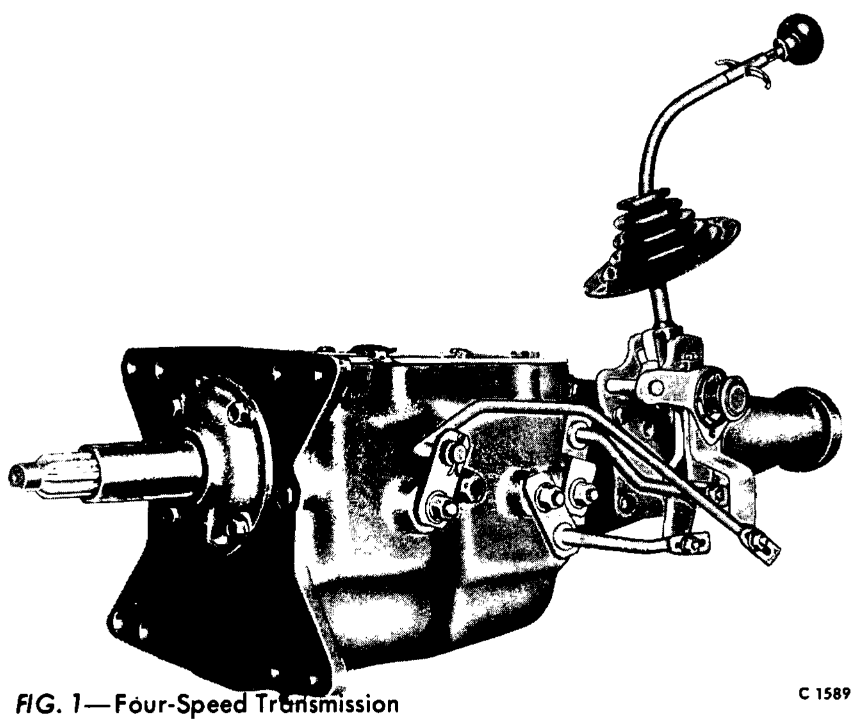


FIG. 1—Four-Speed Transmission

The four-speed transmission will be designated by the numeral 5 on the vehicle warranty plate.

OPERATION

In first-speed (Figure 2), the first- and second-speed synchronizer sleeve is moved rearward by the shift fork. The sleeve engages the first-speed blocking ring, which acts as a cone clutch applied to the free-wheeling first-speed gear. This action speeds up or slows down the first-speed gear to match the speed of the output shaft. Further movement of the sleeve locks the first-and-second-speed synchronizer hub to the first-speed gear by means of internal splines. On engagement of the clutch, power flows through the input shaft and gear to the meshed countershaft gear and thence to the first-speed gear. This gear transmits the power through the locked synchronizer hub to the transmission output shaft. All the other forward-speed gears are in idler motion, as they are all driven by the counter-

shaft (cluster) gear, but they do not transmit power because they are not locked to the output shaft. All the forward-speed shifts are made in the same manner as the first-speed shift, due to the constant-mesh features.

Reverse gear is engaged by moving the reverse sliding gear forward on the reverse idler gear until it meshes with the external teeth (spur-type) of the first- and second-speed synchronizer sleeve. Movement of the sliding gear is accomplished by the center shaft lever. With all forward-speed synchronizer sleeves in neutral, power flow in reverse is through the input shaft to the constant-mesh countershaft (cluster) gear, thence to the constant mesh reverse idler. Splines then carry the power through the reverse sliding gear to the first-and-second speed synchronizer sleeve which is locked to the output shaft. As the reverse sliding gear is meshed with the synchronizer sleeve, power is transmitted to the output shaft, rotating it in a reverse direction.

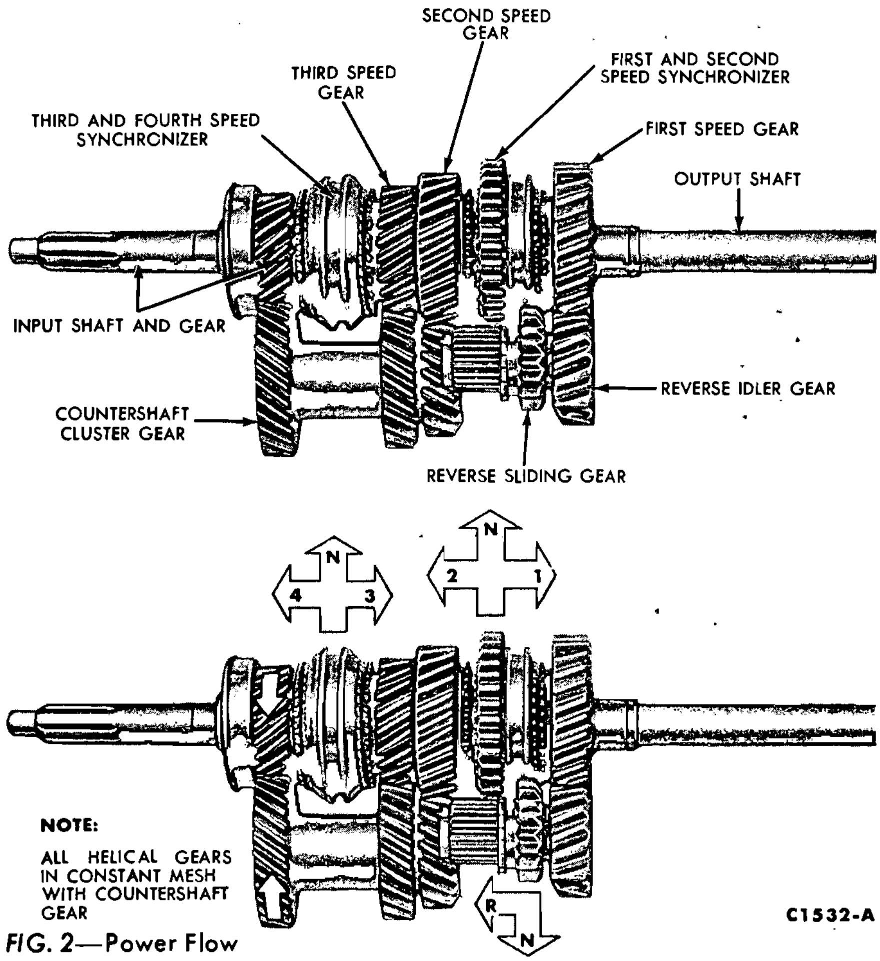


FIG. 2—Power Flow

2 IN-VEHICLE ADJUSTMENTS AND REPAIRS

SHIFT LINKAGE ADJUSTMENT

1. Loosen the three shift linkage adjustment nuts. Install a 1/4 inch diameter alignment tool through the control bracket and levers as shown in Fig. 3.

An alignment tool can be made from 1/4" diameter drill rod bent to an "L" shape. The extensions should be 1 1/2" and 3 3/4" from the elbow. Short end of alignment pin should be inserted into control bracket and linkage holes until it bottoms.

2. Tighten the three linkage adjustment nuts and then remove the alignment pin.

3. Check the gear shift lever for a smooth crossover.

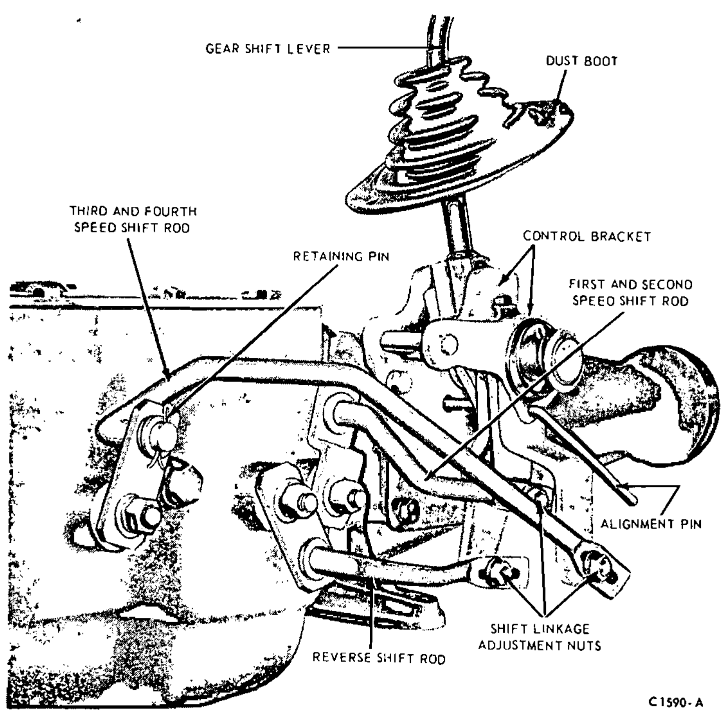


FIG. 3—Adjusting Shift Linkage

3 REMOVAL AND INSTALLATION

REMOVAL

1. Raise the vehicle on a hoist.
2. Disconnect the drive shaft from the rear U-joint flange. Slide the drive shaft off the transmission output shaft and install the extension housing seal installation tool into the extension housing to prevent lubricant leakage.
3. Disconnect the speedometer cable from the extension housing.
4. Remove the retaining clip, flat washer and spring washer that secures the shift rods to the shift levers.
5. Remove the bolts that attach the shift linkage control bracket to the extension housing and allow the assembly to hang by the shift lever.
6. Support the engine with a transmission jack and remove the two nuts securing the transmission rear support to the crossmember.
7. Raise the rear of the engine with the transmission jack. Remove the two nuts, washers and bolts securing the crossmember to the frame Supports. Remove the crossmember.
8. Support the transmission on a jack and remove the bolts that attach the transmission to the flywheel housing.
9. Move the transmission and jack rearward until the transmission input shaft clears the flywheel housing. If necessary, lower the engine enough to obtain clearance for transmission removal.

Do not depress the clutch pedal while the transmission is removed.

INSTALLATION

1. Make sure that the mounting surfaces of the transmission and the flywheel housing are free of dirt, paint, and burrs. Install two guide pins in the flywheel housing lower mounting bolt holes. Move the transmission forward on the guide pins until the input shaft splines enter the clutch hub splines and the case is positioned against the flywheel housing.
2. Install the two upper transmission to flywheel housing mounting bolts snug and then remove the two guide pins. Install the two lower mounting bolts. Torque all mounting bolts to specifications.
3. Raise the rear of the engine high enough to provide clearance for installing the crossmember. Install the two crossmember-to-frame support attaching bolts, washers, and nuts. Do not tighten at this time.
4. Align the bolts in the transmission rear support with the bolt holes in the crossmember, then lower the engine and remove the jack. Install the two transmission rear support-to-crossmember washers and nuts and torque to specifications. Tighten the crossmember-to-frame support nuts.
5. Position the shift linkage control bracket to the extension housing and install the attaching bolts.
6. Secure each shift rod to its respective lever with the spring washer, flat washer, and retaining pin.
7. Connect the speedometer cable to the extension housing.
8. Remove the extension housing installation tool and slide the forward end of the drive shaft over the transmission output shaft. Connect the drive shaft to the rear U-joint flange.
9. Place both forward gear shift levers and the reverse shift lever in the neutral position and insert a 1/4 inch diameter alignment tool in the shift linkage alignment hole (Fig. 3). Adjust the linkage and tighten the adjusting nuts. Remove the alignment tool. Adjust the clutch pedal free travel as required.
10. Fill the transmission to the proper level with the specified lubricant.
11. Lower the vehicle. Check the shift crossover motion for full shift engagement and smooth crossover operation.

4 MAJOR REPAIR OPERATIONS

DISASSEMBLY

1. Mount the transmission in a holding fixture and drain the lubricant.
2. Remove the cover attaching screws from the case. Lift the cover and gasket from the case.
3. Remove the extension housing attaching screws and lock washers. Remove the housing and the gasket.
4. Remove the input shaft bearing retainer attaching screws. Slide the retainer off the input shaft.
5. Support the countershaft gear with a wire hook. Working from the front of the case, push the countershaft out the rear of the case as shown in Fig. 4. Lower the countershaft to the bottom of the case with the wire hook. Remove the hook.
6. Place the first-and-second-speed gear shift lever and the reverse shift lever in the neutral position. Place the thrid- and fourth-speed gear shift lever in the third-speed position.

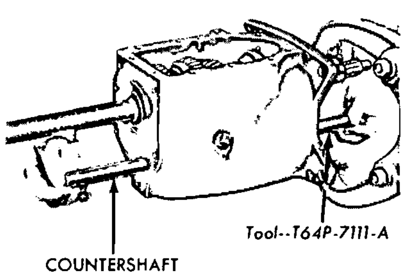


FIG. 4—Removing Countershaft from Case

7. Remove the bolt that retains the third- and fourth-speed shift rail detent spring and the plug in the left side of the case as shown in Fig. 5. Remove the spring and the plug with a magnet.
8. Remove the detent mechanism set screw from the top of the case. Remove the detent spring and plug with a small magnet.
9. Remove the attaching screw from the third- and fourth-speed shift fork. Tap on the inner end of the shift rail to unseal the expansion plug from the front of the case. Then withdraw the third- and fourth-speed shift rail from the front of the case.

Do not lose the interlock pin from the shift rail.

10. Remove the set screw from the first- and second-speed shift fork. Slide the first- and second-speed shift rail out the rear of the case.
11. Remove the interlock plug and the detent plug from the top of the case (Fig. 5) with a magnet.
12. Remove the snap ring that secures the speedometer drive gear to the output shaft. Slide the gear off the shaft, then remove the speedometer gear drive ball.
13. Remove the snap ring that secures the output shaft bearing to the shaft.
14. Remove the output shaft bearing as shown in Fig. 6.

15. Remove the input shaft and bearing and the blocking ring from the front of the case.

16. Move the output shaft to the right side of the case to provide clearance for the shift forks. Rotate the fork as shown in Fig. 7, then lift them from the case.

17. Support the thrust washer and first-speed gear to prevent them from sliding off the shaft, then lift the output shaft assembly from the case as shown in Fig. 8.

18. Remove the reverse gear shift fork set screw. Rotate the reverse shift rail 90° as shown in Fig. 9. Slide the shift rail out the rear of the case. Lift the reverse shift fork from the case.

19. Remove the reverse detent plug and spring from the case with a magnet.

20. Remove the reverse idler gear shaft from the case as shown in Fig. 10.

21. Lift the reverse idler gear and the thrust washers from the case. Be careful not to drop the bearings and the dummy shaft from the gear.

22. Lift the countershaft gear and the thrust washers from the case. Be careful not to drop the bearings or the dummy shaft from the countershaft gear.

23. Remove the snap ring from the front of the output shaft. Slide the third- and fourth-speed synchronizer (Fig. 11) blocking ring and the third-speed gear off the shaft.

24. Remove the next snap ring and the second-speed gear thrust washer from the shaft. Slide the second-speed gear and the blocking ring off the shaft.

25. Remove the next snap ring, first speed gear and blocking ring.

26. Remove the thrust washer from the rear of the shaft. The first and reverse synchronizer hub is a press fit on the output shaft. To eliminate the possibility of damaging the synchronizer assembly, remove the synchronizer hub using an arbor press. **Do not attempt to remove the hub by hammering or prying.**

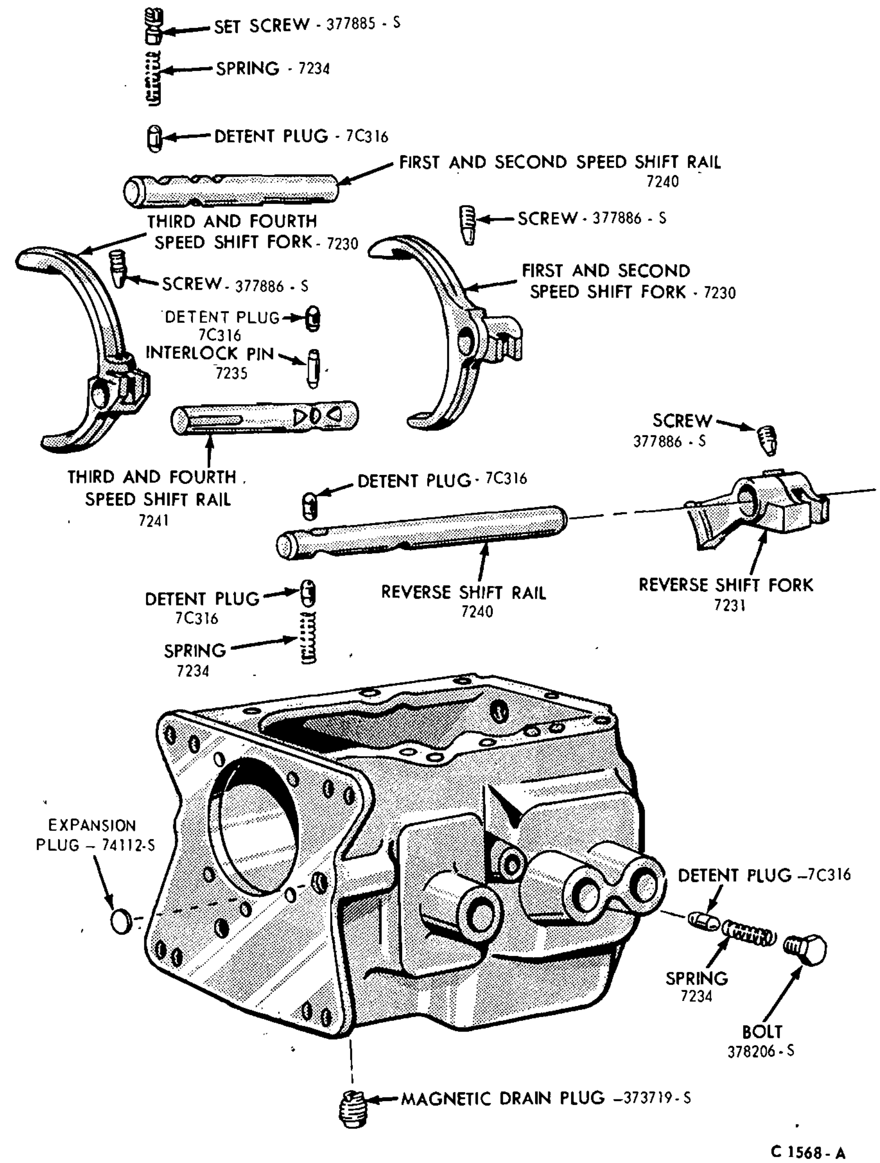


FIG. 5—**Shift Rails and Forks Disassembled**

PARTS REPAIR OR REPLACEMENT

GEAR SHIFT CONTROL ASSEMBLY

1. After removing the six screws from the gear shift lever boot retainer, slide the retainer and boot up on the lever. Remove the plungers and springs from the lever (Fig. 12).

2. Remove the two bolts retaining the shift lever to the trunion and remove the shift lever.

3. Raise the vehicle on a hoist.

4. Disconnect the three shift rods at the transmission by removing the hair pin type retainer (Fig. 3).

5. Remove the three bolts retaining the shift assembly to the transmission extension housing and remove the shift assembly.

6. Remove the back up light switch from the shift assembly.

7. Remove the snap ring from the end of the selector shaft with pointed snap ring pliers (Fig. 12).

8. Remove the flat washer and spring.

9. After removing two bolts, pull the retainer, selector levers and bracket from the shaft.

10. Drive the short selector lever pin from the shaft with a large pin punch.

11. Drive the long trunion pin from the shaft and remove the trunion and shaft.

12. Clean and inspect all parts.

13. Lubricate all mating friction surfaces with Rotunda Lube C1AZ-19586-B.

14. Install the shaft in the bracket. Position the trunion and drive the long straight pin through the trunion and into the shaft until an equal length of the pin is exposed on both sides of the shaft.

15. Drive the short pin into the shaft until the pin is centered in the shaft.

16. Install the selector levers and neutral index on the shaft as shown in Fig. 12.

17. Position the retainer and start the bolts. Before tightening the bolts, be sure that the retainer is not interfering with free movement of the shaft. Tighten the bolts.

18. Install the spring, flat washer and snap ring.

19. Position the shift assembly to the transmission extension housing and install the three retaining bolts.

20. Install the back up light switch.

21. Connect the shift rods at the transmission by installing a wave washer, flat washer and hair pin-type retainer at each connection.

22. Adjust the back up light switch.

23. Adjust the shift linkage cross-over pattern.

24. Lower the vehicle on the hoist.

25. Install the two bolts retaining the shift lever to the trunion. Install the springs and plungers in the shaft.

26. Slide the shift lever boot and retainer down on the shift lever and install the retainer with six screws.

27. Check the operation of the shift assembly.

CAM AND SHAFT SEALS

1. Remove the attaching nut, lock washer and the flat washer from each shift lever and remove the three levers.

2. Remove the three cam and shafts from inside the case.

3. Remove the O-ring from each cam and shaft (Fig. 13) and discard the O-rings.

4. Dip the new O-rings in gear lubricant and install them on the cam and shafts.

5. Slide each cam and shaft into its respective bore in the transmission case.

6. Position a shift lever on each cam and shaft and secure with a flat washer, lock washer and nut.

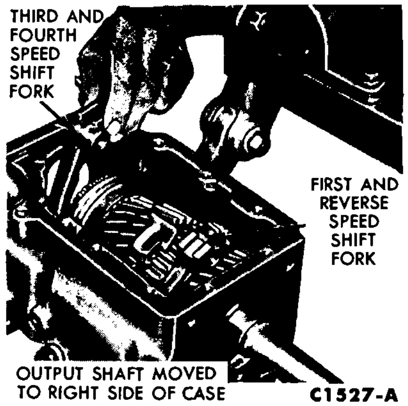


FIG. 7—**Removing Shift Forks from Case**

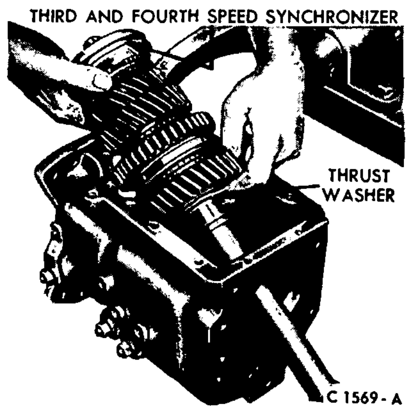


FIG. 8—**Removing Output Shaft Assembly**

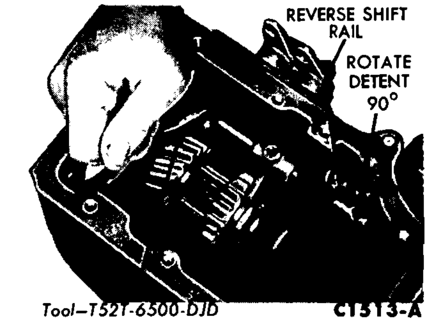


FIG. 9—**Rotating Reverse Shift Rail**

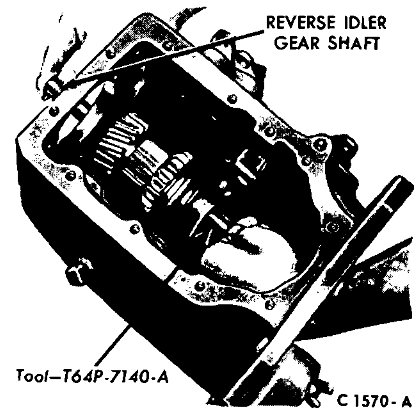
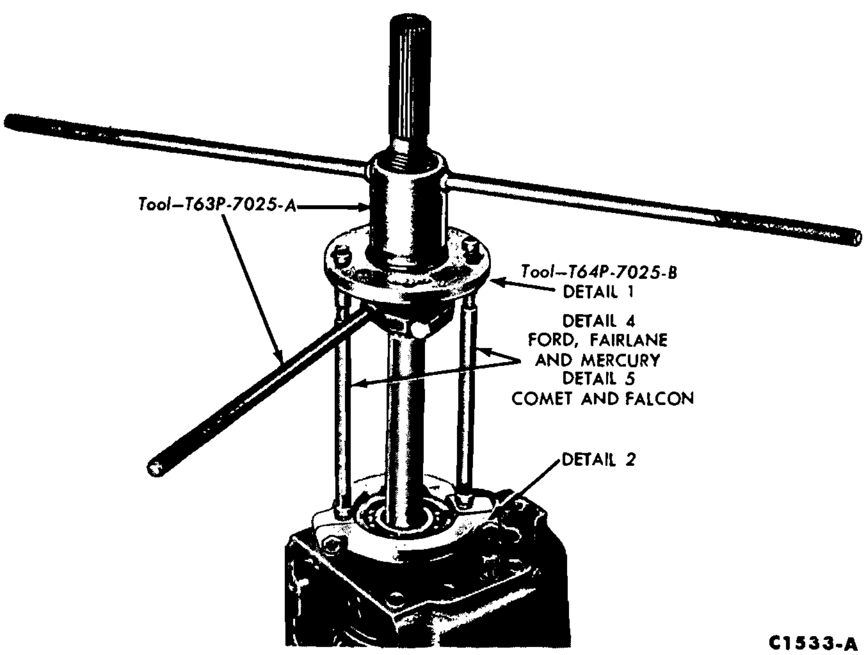


FIG. 10—**Removing Reverse Idler Gear Shaft**



INPUT SHAFT BEARING

1. Remove the snap ring that secures the bearing to the shaft (Fig. 14).

2. Press the input shaft gear out of the bearing as shown in Fig. 15.

3. Press a new bearing onto the input shaft with the tool shown in Fig. 15.

4. Secure the bearing with a snap ring.

SYNCHRONIZERS

1. Push the synchronizer hub from each synchronizer sleeve (Fig. 16).

2. Separate the inserts and insert springs from the hubs. Do not mix the parts of the first- and second-speed synchronizer with the third- and fourth-speed synchronizer.

3. Position the hub in the sleeve, making sure that the alignment marks are properly indexed.

4. Place the three inserts into place on the hub. Install the insert springs making sure that the irregular surface (hump) is seated in one of the inserts. Do not stagger the springs.

COUNTERSHAFT GEAR BEARINGS

1. Remove the dummy shaft, two

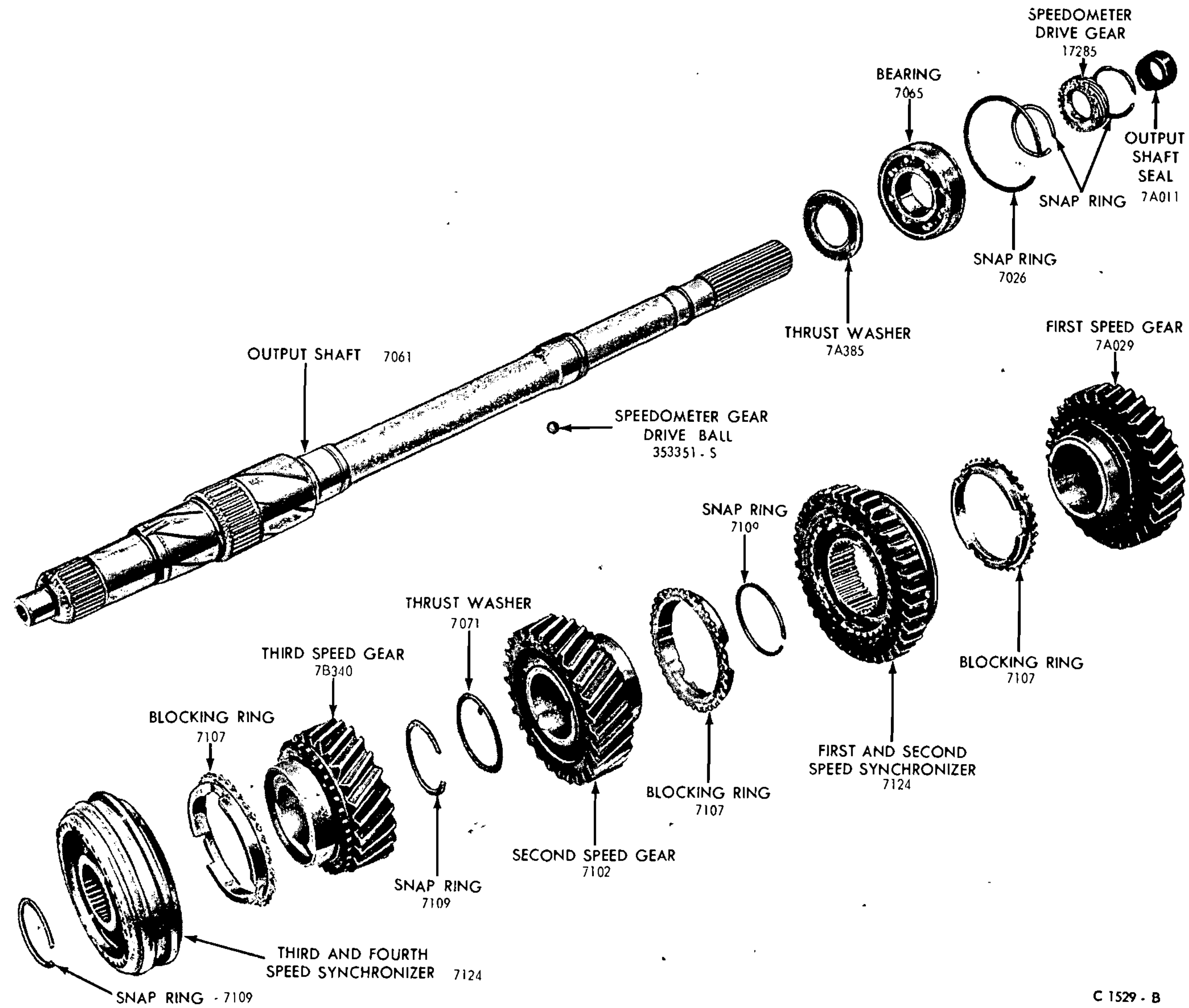


FIG. 11—Output Shaft Disassembled

bearing retainer washers, and the 21 roller bearings (Fig. 17) from each end of the countershaft gear.

2. Coat the bore in each end of the countershaft gear with grease.

3. Hold the dummy shaft in the gear and install the 21 roller bearings and the retainer washer in each end of the gear.

REVERSE IDLER GEAR BEARINGS

1. Slip the reverse idler sliding gear off of the reverse idler gear (Fig. 18).

2. Remove the dummy shaft, two bearing retainer washers and the 44 roller bearings from the reverse idler gear.

3. Coat the bore in each end of the reverse idler gear with grease.

4. Hold the dummy shaft in the gear and install the 22 roller bearings and the retainer washer in each end of the gear.

5. Install the reverse idler sliding gear on the reverse idler gear making sure that the shift fork groove is toward the front (Fig. 18).

INPUT SHAFT SEAL

1. Remove the seal from the input shaft bearing retainer as shown in Fig. 19.

2. Coat the sealing surface with lubricant.

3. Install the seal as shown in Fig. 20.

ASSEMBLY

1. Coat the countershaft gears thrust surfaces in the case with a thin film of lubricant and position a thrust washer (Fig. 17) at each end of the case.

2. Position the countershaft gear, dummy shaft, and roller bearings in the case.

3. Place the case in a vertical position. Align the gear bore and the thrust washers with the bores in the case and install the countershaft.

4. Place the case in a horizontal position and check the countershaft gear end play with a feeler gauge. The end play should be within specification. If not within these limits, replace the thrust washers.

5. After establishing the correct end play, install the dummy shaft in the countershaft gear and allow the gear to remain at the bottom of the case.

6. Coat the reverse idler gear thrust surfaces in the case with a thin film of lubricant and position the two thrust washers (Fig. 18) in place.

7. Position the reverse idler gear, sliding gear, dummy shaft and the

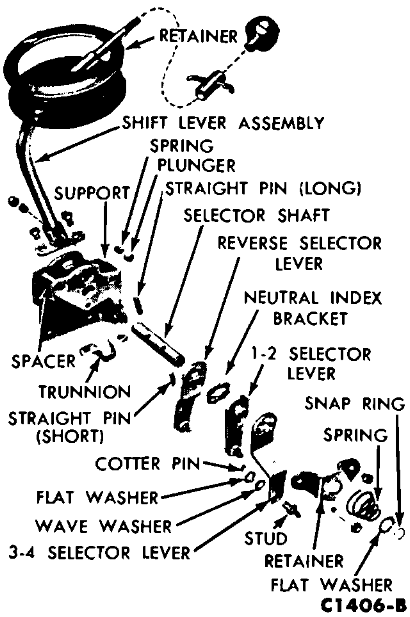


FIG. 12—Gearshift Lever Disassembled—Typical

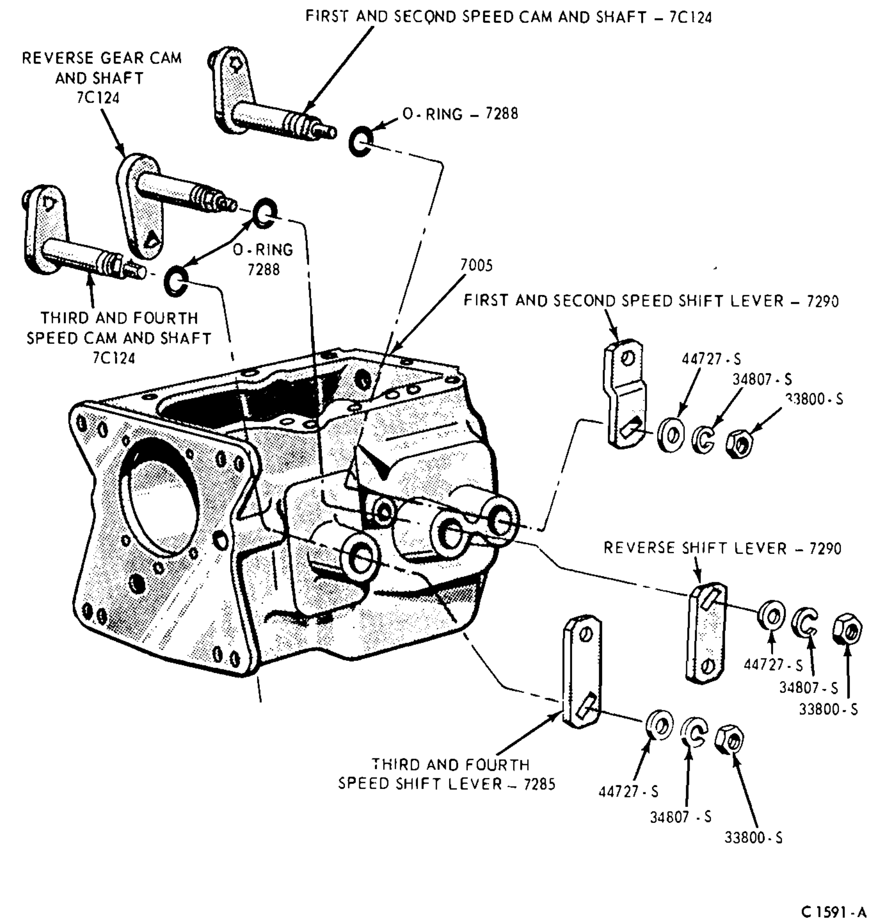


FIG. 13—Cam and Shafts and Shift Levers Disassembled

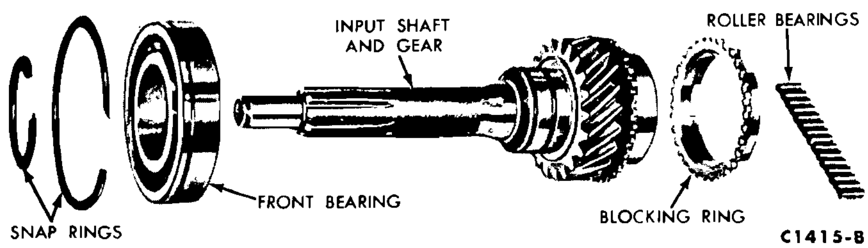


FIG. 14—Input Shaft Gear Disassembled

roller bearings in place making sure that the shift fork groove in the sliding gear is toward the front of the case.

8. Align the gear bore and thrust washers with the case bores and install the reverse idler shaft.

9. Measure the reverse idler gear end play with a feeler gauge. End play should be within specification. If the end play is not within limits, replace the thrust washers. If the end play is within limits, leave the reverse idler gear installed.

10. Position the reverse gear shift rail detent spring and detent plug in the case. Hold the reverse shift fork in place on the reverse idler sliding gear and install the shift rail from the rear of the case. Secure the fork to the rail with the Allen head set screw.

11. Install the first- and second speed synchronizer onto the front of the output shaft (Fig. 11) making sure that the shift fork groove is toward the rear of the shaft.

12. Position the blocking ring on the second-speed gear.

13. Slide the second-speed gear onto the front of the shaft, make sure that the inserts in the synchronizer engage the notches in the blocker ring.

14. Install the second-speed gear thrust washer and snap ring.

15. Slide the third-speed gear onto the shaft with the synchronizer coned surface toward the front.

16. Place a blocking ring on the third-speed gear.

17. Slide the third- and fourth-speed gear synchronizer onto the shaft making sure that the inserts in the synchronizer engage the notches in the blocking ring.

18. Install the snap ring on the front of the output shaft.

19. Position the blocking ring on the first-speed gear.

20. Slide the first-speed gear onto the rear of the output shaft making sure that the notches in the blocking ring engage the synchronizer inserts.

21. Install the heavy thrust washer on the rear of the output shaft.

22. Support the thrust washer and first-speed gear to prevent them from sliding off the shaft. Carefully lower the output shaft assembly into the case as shown in Fig. 8.

23. Position the first- and second-speed shift fork and the third- and fourth-speed shift fork in place on their respective gears and rotate them into place.

24. Place a detent plug (Fig. 5) in the detent bore. Place the reverse shift rail into neutral position.

25. Coat the third- and fourth speed shift rail interlock pin with grease and position it in the shift rail.

The first and reverse synchronizer hub is a press fit on the output shaft.

To eliminate the possibility of damaging the synchronizer assembly, install the synchronizer hub using an arbor press. **Do not attempt to install the hub by hammering or prying.**

26. Align the third- and fourth-speed shift fork with the shift rail bores and slide the shift rail into place making sure that the three detents are facing toward the outside of the case. Place the front synchronizer into third-speed position and install the set-screw in the third- and fourth-speed shift fork. Move the synchronizer to the neutral position. Install the third- and fourth-speed shift rail detent plug, spring and bolt in the left side of the transmission case (Fig. 5). Place the interlock plug (tapered ends) in the detent bore.

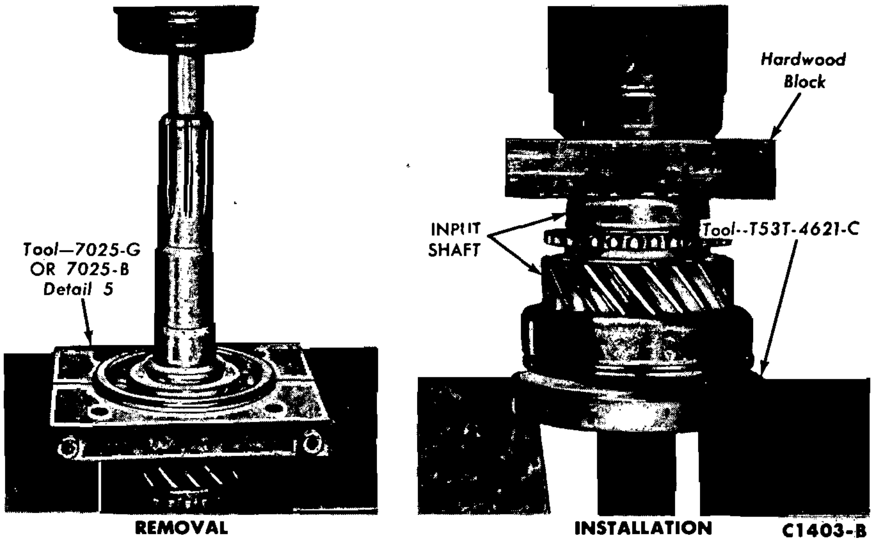


FIG. 15—Replacing Input Shaft Bearing

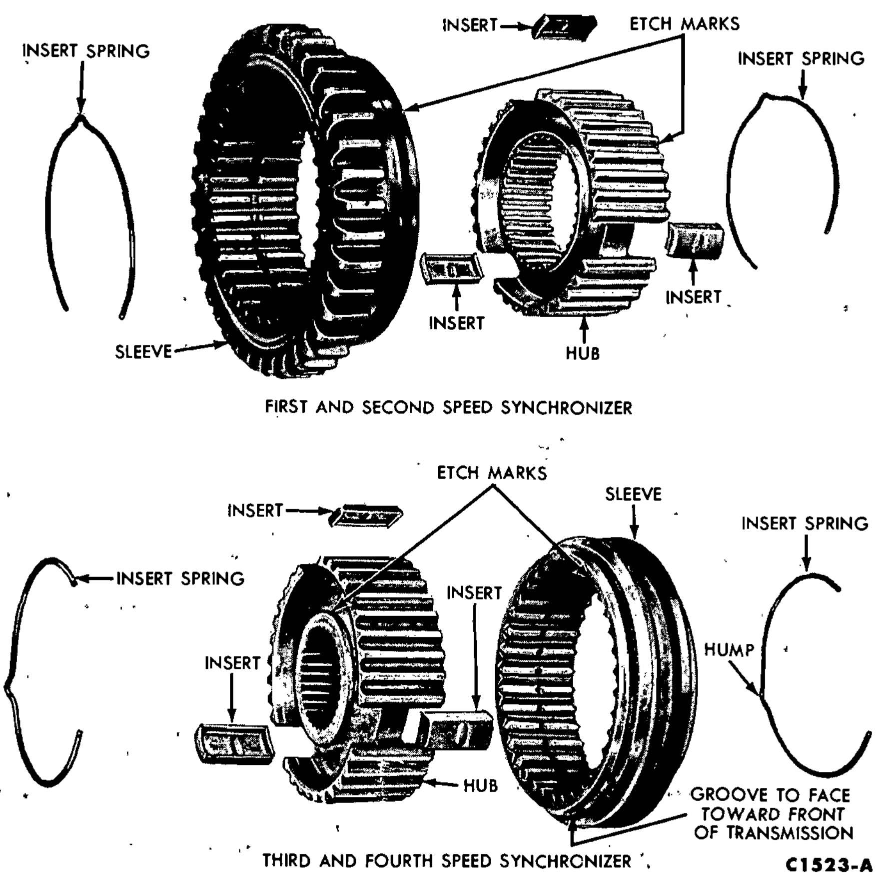


FIG. 16—Synchronizers Disassembled

27. Align the first- and second-speed shift fork with the case bores and slide the shift rails into place. Secure the fork with the set screw. Install a detent plug and spring in the detent bore. Thread the set screw to specifications.

28. Coat the input gear bore with a thin film of grease, then install the 15 roller bearings in the bore. **A thick film of grease could plug the lubricant holes and restrict lubrication to the bearings.**

29. Position the front blocking ring in the third- and fourth-speed synchronizer. Place the input shaft gear in the transmission case making sure that the output shaft pilot enters the roller bearings in the input gear.

30. Place a new gasket on the input shaft bearing retainer. Dip the attaching bolts in sealer and install and tighten them to specifications.

31. Install the output shaft bearing as shown in Fig. 21. Install the snap ring to retain the bearing.

32. Position the speedometer gear drive ball in the output shaft and slide the gear into place. Secure the gear with the snap ring.

33. Place the transmission in a vertical position as shown in Fig. 22. Align the countershaft gear bore and thrust washers with the bore in the case. Install the countershaft.

34. Use a new gasket and secure the extension housing to the case with the attaching screws. Use a sealer on the extension housing attaching screws. Torque the screws to specifications.

35. Install the filler and drain plugs in the case if they were removed. Make sure that the magnetic plug is installed in the bottom of the case.

36. Pour the specified lubricant over the entire gear train while rotating the input shaft.

37. Place each shift fork in all positions to make sure that they operate properly.

38. Use a new cover gasket and install the cover. Coat the cover attaching screws with sealer and install and tighten them to specifications.

39. Coat the third- and fourth-speed shift rail plug bore with a sealer and install a new expansion plug.

40. If the extension housing bushing and seal are to be replaced, refer to Section 4.

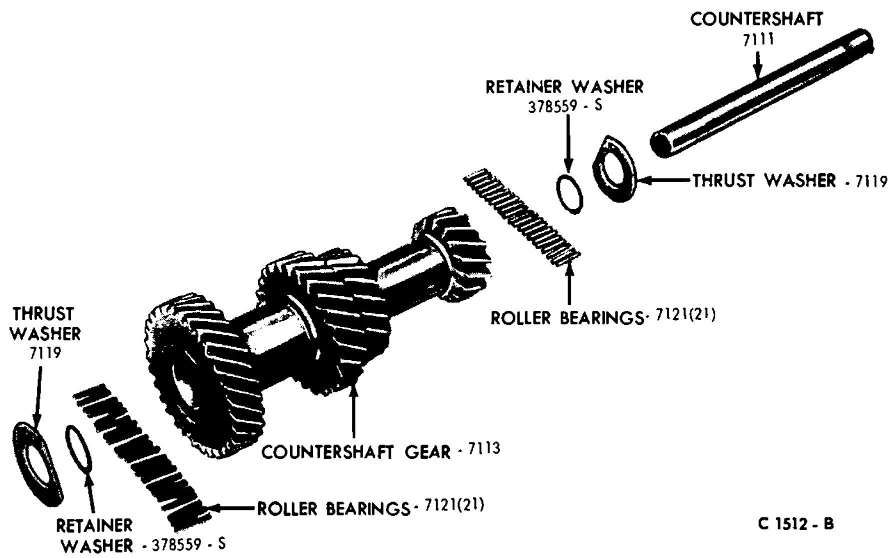


FIG. 17—Countershaft Gear Disassembled

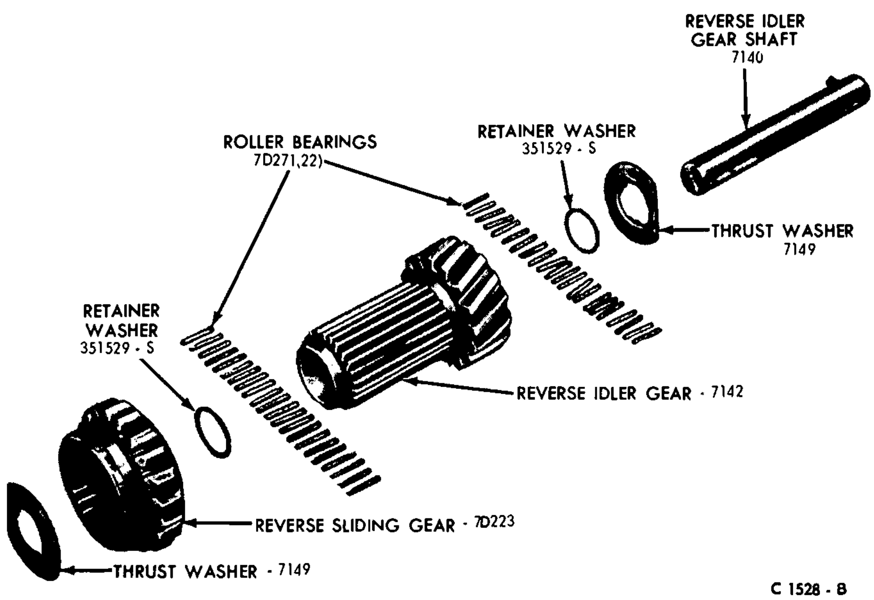


FIG. 18—Reverse Idler Gear Disassembled

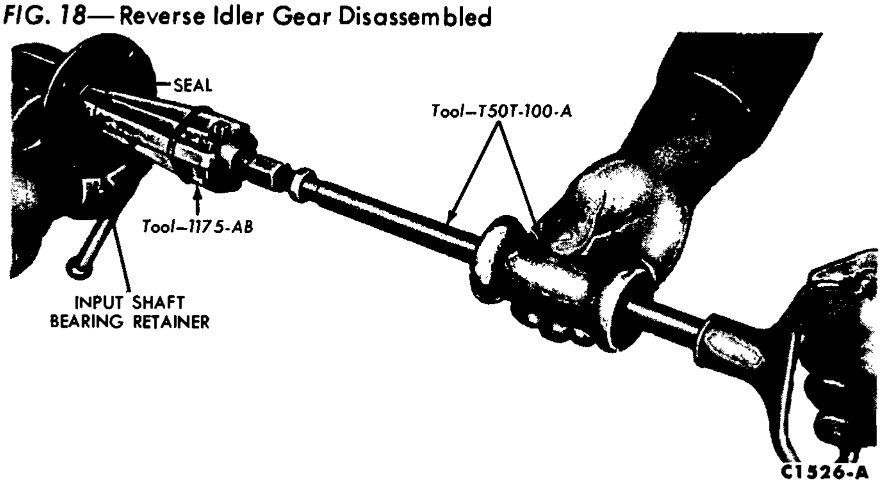


FIG. 19—Removing Input Shaft Seal

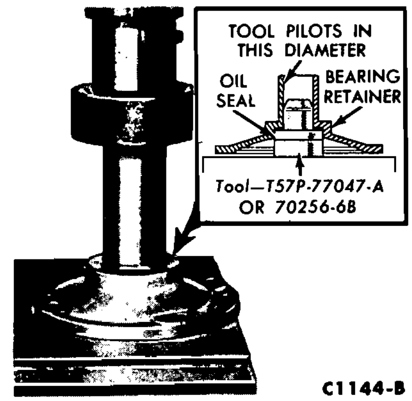


FIG. 20—Installing Input Shaft Seal

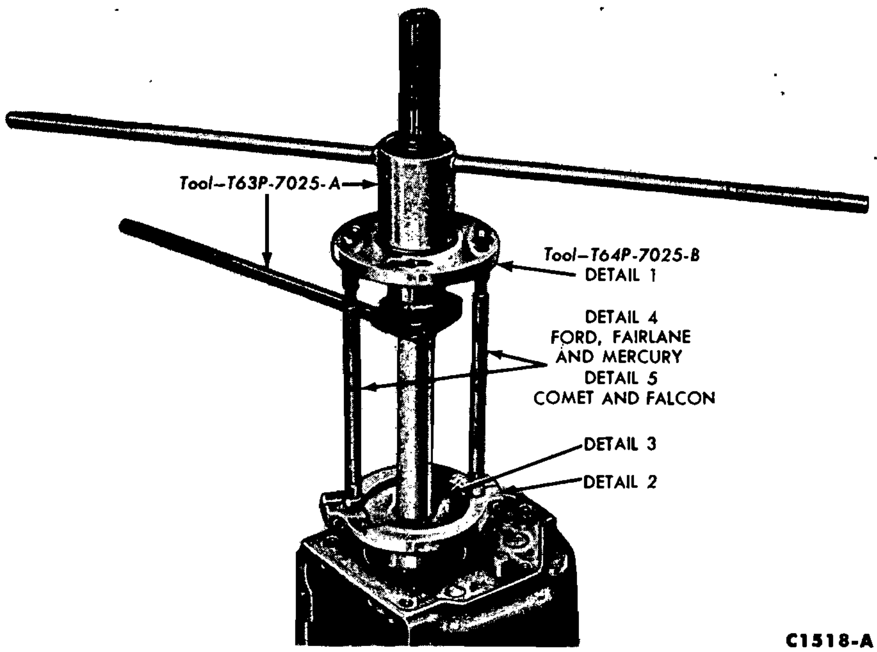


FIG. 21—Installing Output Shaft Bearing

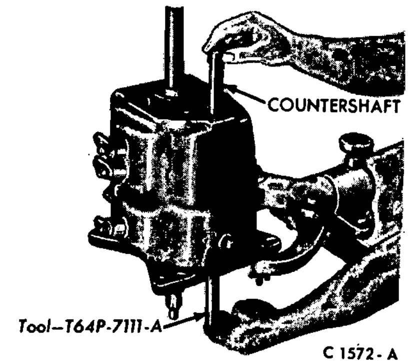


FIG. 22—Installing Countershaft

PART 6-5—Overdrive Transmission

1 DIAGNOSIS AND TESTING

When trouble occurs in the overdrive unit, check the mechanical operation of the unit before checking the operation of the overdrive electrical control system.

MECHANICAL CHECKS

OVERDRIVE CONTROL HANDLE CLEARANCE CHECK

Check the specified clearance between the overdrive control handle shank and the bezel on the instrument panel.

OVERDRIVE CONTROL LEVER POSITION CHECK

Raise the car and check the position of the overdrive control lever at the overdrive unit housing. The lever should rest firmly against its stop at the rear. If the lever is not all the way back the overdrive shift rail may be locking the pawl and preventing it from engaging the balk ring gear.

With the engine stopped and the clutch engaged, shift the transmission to third or second gear and shift the overdrive control lever to the automatic (rearward) position. The drive shaft should then turn freely in a clockwise direction (when viewed from the front), but should lock up when turned counterclockwise.

With the transmission remaining in third or second gear, shift the overdrive control lever to the locked-out (forward) position. The drive shaft should lock up when turned either clockwise or counterclockwise.

PAWL ENGAGEMENT CHECK

Check the mechanical engagement of the pawl with the balk ring gear, using the following procedure:

1. Turn the ignition switch to the ON position and raise the vehicle.
2. Shift the overdrive control lever to the locked-out (forward) position, and shift the transmission to neutral.
3. Turn the drive shaft clockwise and, at the same time ground the governor white wire with a jumper. The solenoid will click, indicating that it is energized.
4. Keep the solenoid energized, and shift the transmission to third or second gear to lock the transmission output shaft against rotation. Shift the overdrive control lever to the automatic (rearward) position.
5. Turn the drive shaft clockwise. At less than 1/4 turn of the driveshaft, the pawl will engage the balk ring gear and lock the drive shaft against rotation in both directions.

If the pawl does not engage the balk ring gear, replace the solenoid and repeat the test. If the pawl still does not engage, remove the overdrive unit from the vehcile for inspection and repair.

ELECTRICAL CHECKS

GOVERNOR CIRCUIT CHECK

1. Turn the ignition switch ON and OFF, and listen for the relay or solenoid to click. If either clicks as soon as the ignition switch is turned ON, the governor circuit (Fig. 1) is grounded or the relay is defective.
2. To determine which condition is present, remove the wire from the TH-SW terminal on the relay and turn the ignition switch ON. If the relay clicks, the relay is defective. If it does not click, the governor circuit is grounded.
3. To check the governor operation when the relay does not click as the ignition switch is turned ON, disconnect the wire at the TH-SW terminal.
4. Raise the rear wheels off the floor.
5. Connect a test lamp between the battery and the wire removed from the TH-SW terminal.
6. Start the engine and, with the transmission in third-speed, bring the speedometer reading up through 28 mph. The lamp should light at or about this speed.
7. Throttle the engine down

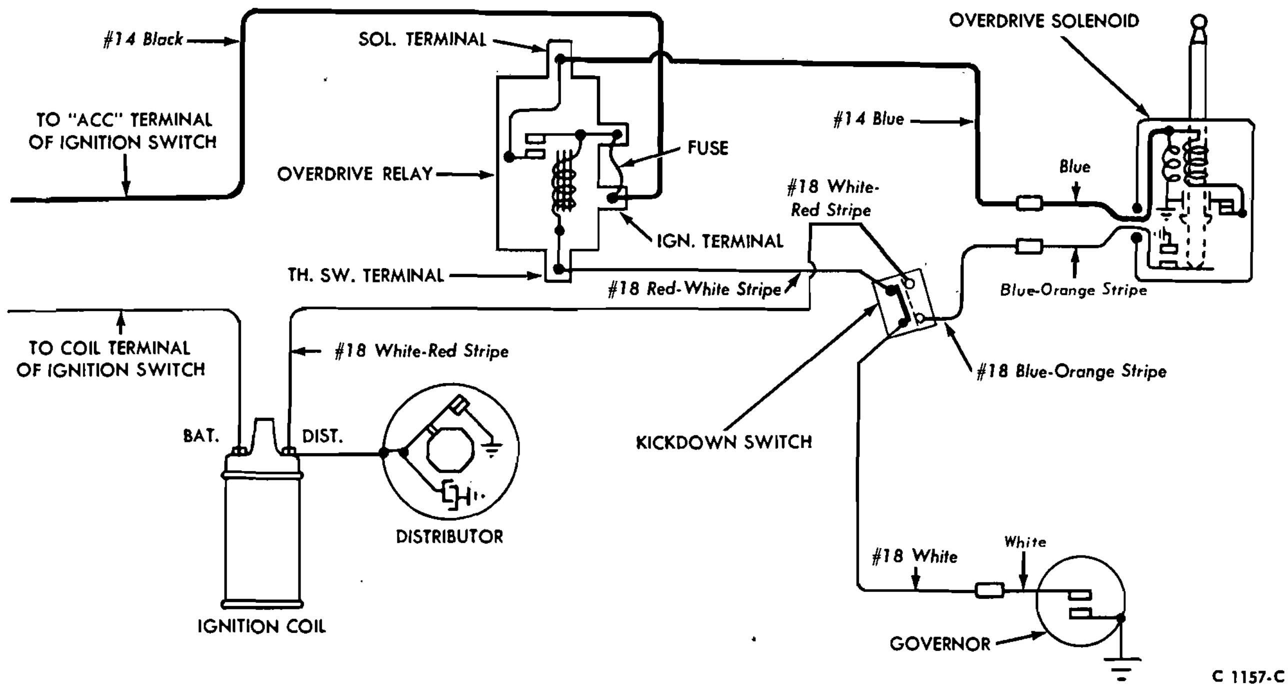


FIG. 1—**Overdrive Electrical System**

through 22 mph and at or about this speed the lamp should go out. If the lamp lights, and goes out at or about these speeds, the governor and governor circuit are working properly.

8. Turn the ignition switch ON and raise the car. Disconnect the yellow wire from the white wire at the governor connector.

9. Ground the white wire on the transmission case. If the relay and solenoid click, the governor circuit is working properly from the TH-SW terminal to the connector (Fig. 1), and the trouble is in the yellow wire or the governor. If the relay and solenoid do not click when the white wire is grounded, the trouble is between the TH-SW terminal and the connector (Fig. 1).

SOLENOID CIRCUIT CHECK

1. With the engine stopped and the ignition switch ON, ground the TH-SW terminal on the relay. If the relay and solenoid click as the ground is made and broken, the solenoid circuit is working properly. If the relay does not click as the TH-SW terminal is grounded, check the relay IGN terminal with a test lamp.

2. With the ignition switch ON, the test lamp should light when it is connected between the IGN terminal on the relay and at a ground. If it does not, the trouble is between the ignition switch and the IGN terminal.

3. Connect the test lamp at the other end of the fuse and at a ground. If the lamp lit at the IGN end and not at the other, replace the fuse. **Sometimes the fuse will "open" under the fuse end caps where the "open" cannot be seen.**

4. With current at both ends of the fuse, connect the test lamp between the solenoid terminal and at a ground. Ground the TH-SW terminal. The lamp should light. If it does not, replace the relay.

5. With the relay working properly, the solenoid should click when the TH-SW terminal is grounded. If it does not, connect a jumper from the SOLENOID relay terminal to the short blue wire separated from its connector near the solenoid. If the solenoid does not click when the relay closes with the jumper wire connected, replace the solenoid. If it does click, replace the wire from the SOLENOID relay terminal to the connector.

INTERRUPTER CIRCUIT CHECK

If the interrupter circuit does not ground the engine ignition momentarily when the driver depresses the accelerator pedal to the floor, the overdrive unit cannot shift from overdrive to direct.

1. The first check of the ignition interrupter circuit is at the ignition coil. The black wire which runs from the ignition coil to the kickdown switch must be connected to the DIST terminal on the coil. Sometimes this wire is improperly connected to the BAT terminal during ignition work.

2. Disconnect the blue wire with an orange band (Fig. 1) from its connector near the solenoid, and ground it to the transmission case with a jumper.

3. With the engine running at fast idle, push the kickdown switch stem in until it bottoms (Fig. 2). When the stem bottoms, the engine should stop.

If it does not stop, the circuit is open between the DIST terminal and the connector.

4. To check the ignition grounding contacts inside the solenoid, disconnect the jumper and remove the solenoid from the overdrive unit.

5. Attach the solenoid to an adapter so that the stem can extend fully when the solenoid is energized. Make sure the solenoid is grounded.

6. Connect both solenoid wires at their connectors.

7. Ground the governor wire with a jumper.

8. With the engine running at fast idle, press in on the kickdown switch stem until it bottoms. The engine should stop. If it does not, replace the solenoid.

2 CLEANING AND INSPECTION

CLEANING

Clean and inspect the transmission unit parts in the same manner as for the conventional transmission. Clean all overdrive parts thoroughly. **Do not clean, wash or soak transmission seals in cleaning solvent.**

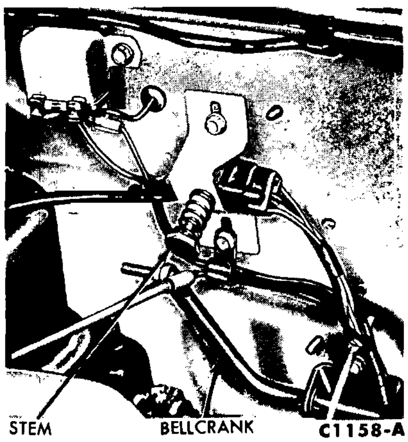


FIG. 2—Kickdown Switch Installation

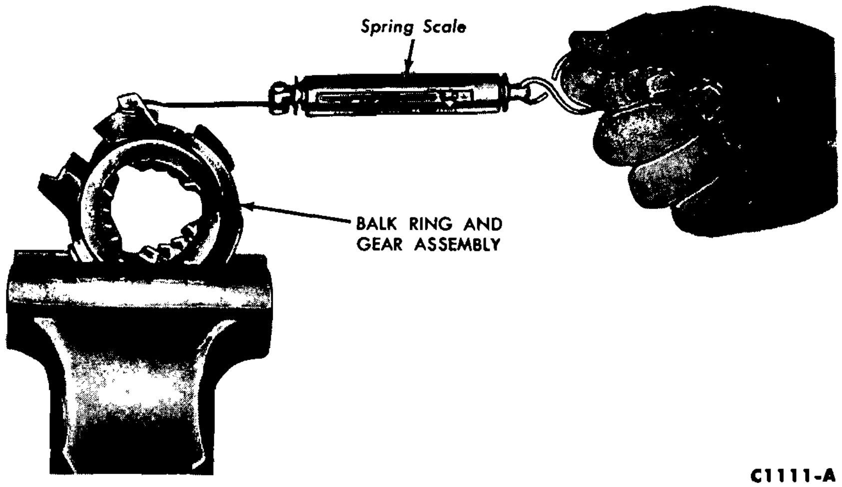


FIG. 3—Checking Balk Ring Tension

INSPECTION

Check the balk ring tension, as shown in Fig. 3 for a pull of 3 1/2-5 1/2 pounds. Read the spring scale while the balk ring is turning, because the initial effort required to start the ring turning may be considerably higher than the specified pull. Replace the assembly if the tension is not within specifications.

Check the inner surface of the free-wheel clutch outer race. If the surface is worn or "chattered," the overdrive output shaft must be replaced.

Check the clutch rollers for cracks and wear. Replace the complete set of 12 rollers if any are cracked or worn.

3 DESCRIPTION AND OPERATION

DESCRIPTION

The overdrive transmission is used on Fairlane models having 289 C.I.D. engines. A transmission service identification tag is located under the upper right extension to case attaching bolt. The tag will show the transmission model and service identification code when required.

The overdrive unit is basically an automatic planetary transmission attached to the rear of a conventional three-speed transmission (Fig. 4) to provide four forward speeds instead of three. The overdrive can be mechanically locked out by a control cable located on the instrument panel.

The electrical system which controls the operation of the overdrive when the control cable is pushed in, consists of a relay, a manual kickdown switch, solenoid, governor, and the circuit wiring.

OPERATION

MECHANICAL OPERATION

Direct, Free-Wheeling Drive

When the control handle is pushed in, the drive through the overdrive unit from start to approximately 28 mph is direct (1.00:1) and free-wheeling.

The power flow is from the transmission output shaft, through the overrunning clutch (free-wheel unit), to the overdrive main shaft (Fig. 5).

This drive is said to be free-wheeling because the overrunning clutch permits the transmission output shaft to drive the overdrive main shaft, but it does not permit the drive to reverse. **In a free-wheeling drive, the engine can drive the rear wheels, but the rear wheels cannot drive the engine.**

In direct, free-wheeling drive, the planetary gearing is in neutral, because the sun gear can run free. It can rotate clockwise (from the front), counterclockwise, or stand still, depending on the relative speeds of the planet carrier (transmission output shaft), and the internal ring gear (overdrive main shaft). At a 0.70:1 ratio, the sun gear will stand still. At a higher ratio, the sun gear will turn clockwise (from the front). At a lower ratio than 0.70:1, it will turn counterclockwise.

Overdrive

To shift the overdrive unit from the direct (1.00:1) to overdrive (0.70:1) the sun gear is held against rotation (Fig. 5).

This is accomplished by engaging a pawl in the balk ring gear which is splined to the sun gear.

In overdrive, the power flow is from the transmission output shaft to the planet carrier splined to it, through the planet gears and then

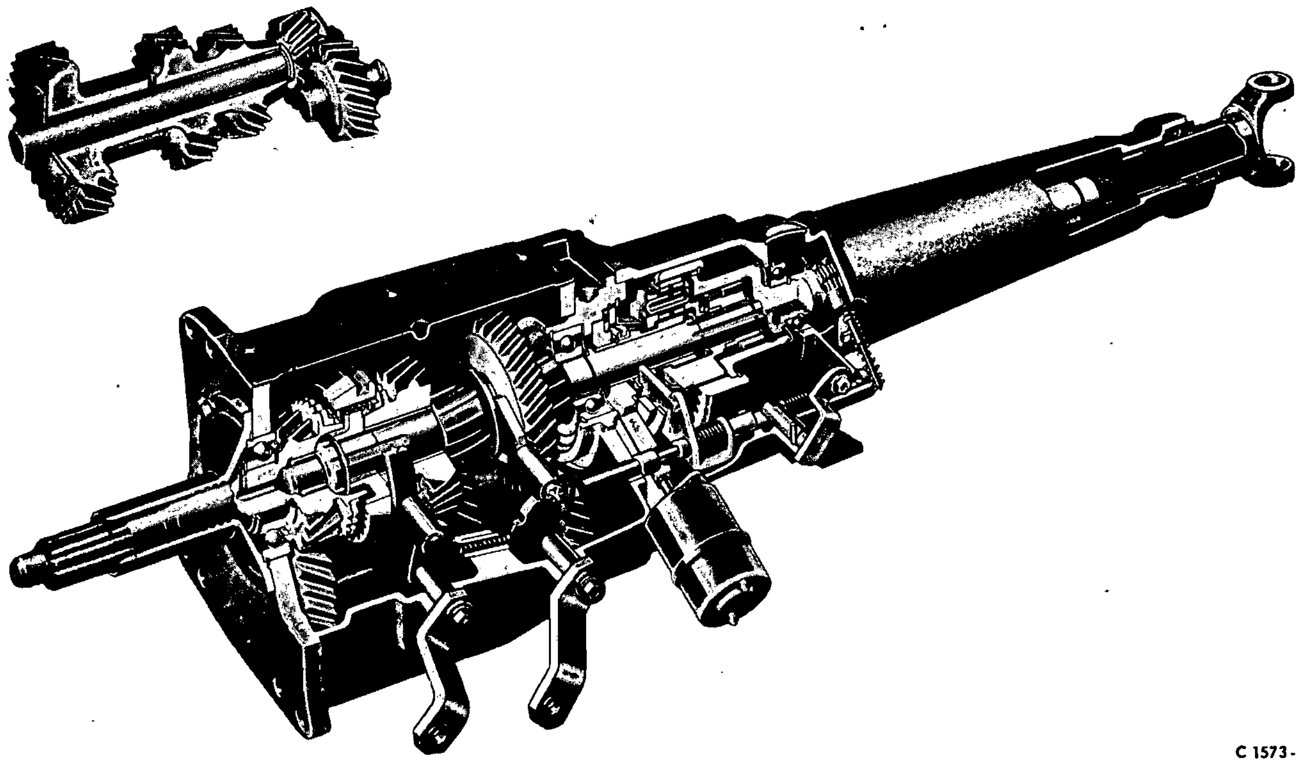


FIG. 4—Overdrive Transmission

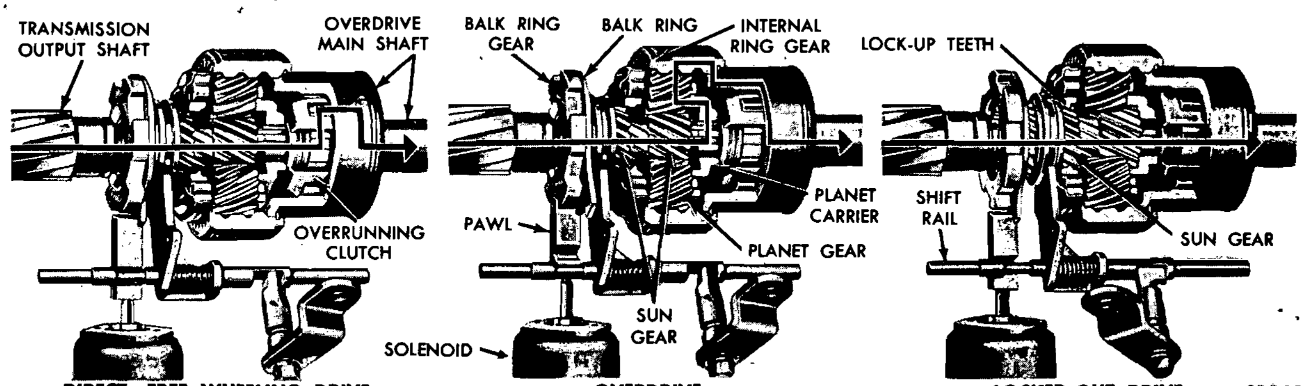


FIG. 5—Overdrive Power Flow

to the sun gear. With the sun gear held against rotation, the planet gears are forced to "walk around" the sun gear and drive the internal ring gear. The transmission output shaft will then drive the overdrive main shaft at a ratio of 0.70:1.

In overdrive, the overrunning clutch is uncoupled because the outer race (overdrive main shaft) is turning faster than the clutch cam (transmission output shaft). Overdrive is a two-way drive; the engine can drive the rear wheels and the rear wheels can drive the engine.

To shift from overdrive back to direct, the pawl is disengaged from the balk ring gear, permitting the sun gear to run free. The overdrive gearing is now in neutral. As soon as the speed of the transmission output shaft comes up to the speed of the overdrive main shaft, the overrunning clutch automatically locks up and direct drive is restored.

Locked-Out Drive

When the control handle is pulled out, the overdrive unit cannot function at any speed. This lockout is accomplished by the shift rail moving the sun gear into engagement with the lock-up teeth on the planet carrier (Fig. 5).

When the sun gear is locked to the planet carrier, the planetary gearing is locked as one mechanical unit and the transmission output shaft is locked to the overdrive main shaft. This lock-up is necessary in reverse, because the transmission output shaft reverses its rotation and therefore cannot drive the overdrive main shaft through the overrunning (one-way) clutch. The lock-up in reverse is accomplished by the low and reverse position. This locked-up drive is also necessary when the vehicle is pushed to start the engine, since the overrunning clutch will not transmit power from the overdrive main shaft to the transmission output shaft.

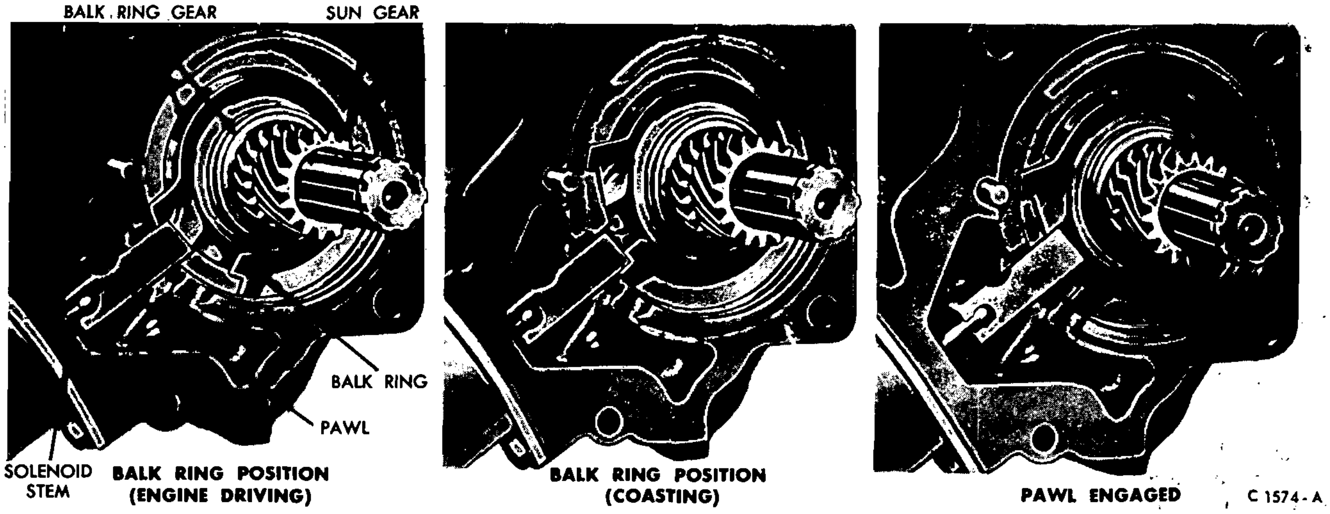


FIG. 6—Pawl and Balk Ring Positions

ELECTRICAL SYSTEM

The overdrive electrical system, which engages and disengages the pawl, consists of a relay, a manual kick-down switch, a solenoid, a centrifugal governor and the circuit wiring.

There are three separate circuits (Section 1, Fig. 1) in the electrical system: a governor circuit which opens and closes the relay, a solenoid circuit which supplies current through the relay to energize the solenoid, and an ignition interrupter circuit, which momentarily grounds the engine ignition for full-throttle downshift (kickdown).

Pawl Engagement

The electrical system does not operate until car speed reaches approximately 28 mph. At this speed, the governor contacts close, permitting current to flow from the battery through the relay to the solenoid.

There are two coils in the solenoid, usually referred to as the "pull-in" and "hold-in" coils. The pull-in coil is energized only while the solenoid plunger is being pulled in. As soon as the plunger is in, a set of points inside the solenoid opens the pull-in circuit.

As the plunger is pulled in, an engaging spring and a return spring are engaged.

Under pressure from the pawl engaging spring, the pawl is pushed in until it strikes the balk ring.

The usual position of the balk ring when the solenoid engaging spring pushes the pawl against it is shown in the left view of Fig. 6. When the transmission output shaft is driving the overdrive main shaft through the overrunning clutch, all elements of the planetary gearing are revolving as a unit; and in a counterclockwise (from the rear) direction. This rotates the balk ring against the pawl.

When the driver releases the throttle, the overdrive main shaft overruns the transmission output shaft. When this overrun exceeds the ratio of 0.70:1, the sun gear and balk ring reverse, releasing the pawl to engage the balk ring gear.

The position of the balk ring, should the solenoid be energized when the vehicle is coasting (engine idling) up through 28 mph, is shown in the right view of Fig. 6. Under this condition the sun gear will be rotating clockwise (from the rear) and the pawl will be blocked.

The pawl engages when the engine speeds up, and brings the transmission output shaft up through the 0.70:1 ratio with the overdrive main shaft. This action will cause the sun gear to reverse its clockwise (from the rear) rotation and release the pawl to engage the balk ring gear.

Pawl Disengagement

The pawl disengages under two conditions. First when the vehicle speed drops below approximately 22 mph, the governor opens the circuit through the relay and de-energizes the solenoid, permitting the return spring to pull out the pawl. Second, the driver may shift the overdrive back to direct drive at any road speed, by pressing the accelerator pedal to the floor so that it depresses the kickdown switch stem.

When this happens, the kickdown switch opens the governor circuit through the relay, and de-energizes the solenoid, permitting the return spring to try to pull out the pawl.

Also, it closes the interrupter circuit and grounds the ignition long enough for the return spring to pull out the pawl.

Normal ignition is restored as soon as the pawl comes out, and the solenoid stem opens the ignition grounding contacts. The actual time of ignition interruption is equal to that required for one revolution of the crankshaft.

4 IN-VEHICLE ADJUSTMENTS AND REPAIRS

OVERDRIVE CONTROL CABLE ADJUSTMENT

1. Loosen the overdrive cable lock nut at the overdrive control lever.
2. Position the overdrive cable until there is 1/4 inch clearance between the cable control handle and bezel.
3. Move the overdrive control lever to the rear against the stop. When moving the lever, be careful not to move the cable out of position.
4. Tighten the control cable lock nut on the overdrive.

5 TRANSMISSION REMOVAL AND INSTALLATION

REMOVAL

The overdrive unit cannot be removed from the vehicle as a separate assembly. Remove the transmission and overdrive unit together, following the steps detailed below:

1. Disconnect the solednoid and governor wires from the connectors near the solenoid.
2. Remove the overdrive wiring harness from its clip on the transmission.
3. Disconnect the overdrive control cable from the lever on the side of the overdrive unit and from the clamp at the solenoid.
4. Remove the overdrive transmission from the vehicle, following the procedure given in Part 6-2 for removing the 3-speed Conventional Drive transmission.

Do not depress the clutch pedal while the transmission is removed.

INSTALLATION

The overdrive unit must be assembled and installed on the transmission before the transmission is installed in the car.

1. Install the overdrive transmission in the vehicle, following the procedure given in Part 6-2 for installing the 3-speed Conventional Drive transmission.
2. Connect the overdrive control cable to the lever on the side of the overdrive unit. With the cable connected, there must be 1/4 inch clearance between the control handle shank and the bezel when the lever at the overdrive housing is against its rear stops.
3. Connect the solenoid and governor to the connectors near the solenoid.
4. Install the overdrive wiring harness in its clip on the transmission.

6 MAJOR REPAIR OPERATIONS

DISASSEMBLY

1. Mount the transmission in a holding fixture. Then, drain the transmission and the overdrive unit.
2. Remove the solenoid retaining screw, and then rotate the solenoid about 1/4 turn to remove it.
3. Remove the governor.
4. Remove the transmission cover and gasket.
5. With a sharp punch, pierce the snap ring hole cover in the overdrive housing (Fig. 7), and remove the cover.

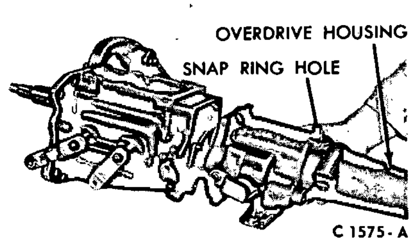


FIG. 7—Removing Overdrive Housing

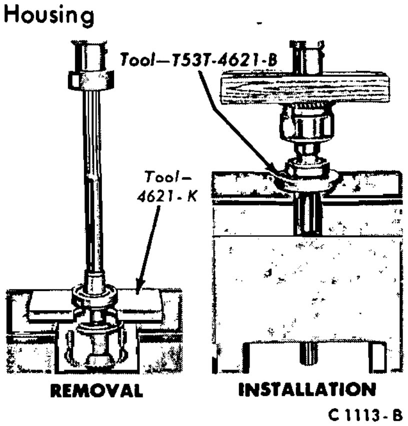


FIG. 8—Replacing Output Shaft Bearing

6. Remove the four overdrive housing to transmission case bolts, and the overdrive control shaft pin.

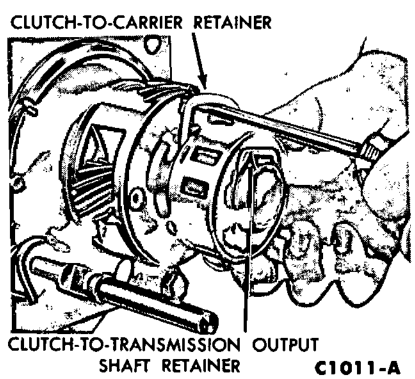


FIG. 9—Removing Free Wheel Unit Retainer

7. Pull the overdrive control lever and shaft out as far as possible. Spread the snap ring that retains the overdrive output shaft bearing and then remove the overdrive housing (Fig. 7).

It may be necessary to tap the overdrive output shaft with a soft-faced hammer to free the output shaft bearing from the housing.

8. Remove the overdrive output shaft from the assembly. Catch any of the free-wheel unit rollers that drop out. Remove the rest of the rollers.
9. Remove the speedometer gear retaining snap ring. Remove the gear and drive ball.
10. If the overdrive output shaft bearing is to be replaced use the tools shown in Fig. 8.
11. Remove the free-wheel unit retainers (Fig. 9). Then remove the clutch, planet carrier, sun gear, and shift rail.
12. Remove the snap ring from the adapter, and then remove the plate and trough, balk ring gear and pawl.
13. Remove the input shaft bearing retainer and gasket (Fig. 10).

Replace the input shaft seal with the same tools that are used on the conventional 3-speed transmission.

14. Rotate the overdrive adapter to expose the countershaft lock, and remove the lock.
15. With a drift, drive the countershaft toward the rear until it just clears the hole at the front of the case, support the countershaft gear with a hook then push the countershaft out of the rear with the tool shown in Fig. 11.
16. Lower the countershaft gear to the bottom of the case to provide clearance for removal of the input shaft and bearing. Tap the input shaft and bearing out of the front of the case.
17. Remove the shift lever shaft retaining pins (Fig. 12).
18. Pull the low and reverse shift lever out as far as it will go; then remove the low and reverse fork.
19. Remove the overdrive adapter and transmission output shaft as an assembly (Fig. 13).
20. Remove the snap ring at the front of the transmission output shaft, and then slide the synchronizer intermediate gear, and the sliding low and reverse gear off the shaft.
21. Lift the countershaft gear, thrush washers and dummy shaft from the case.

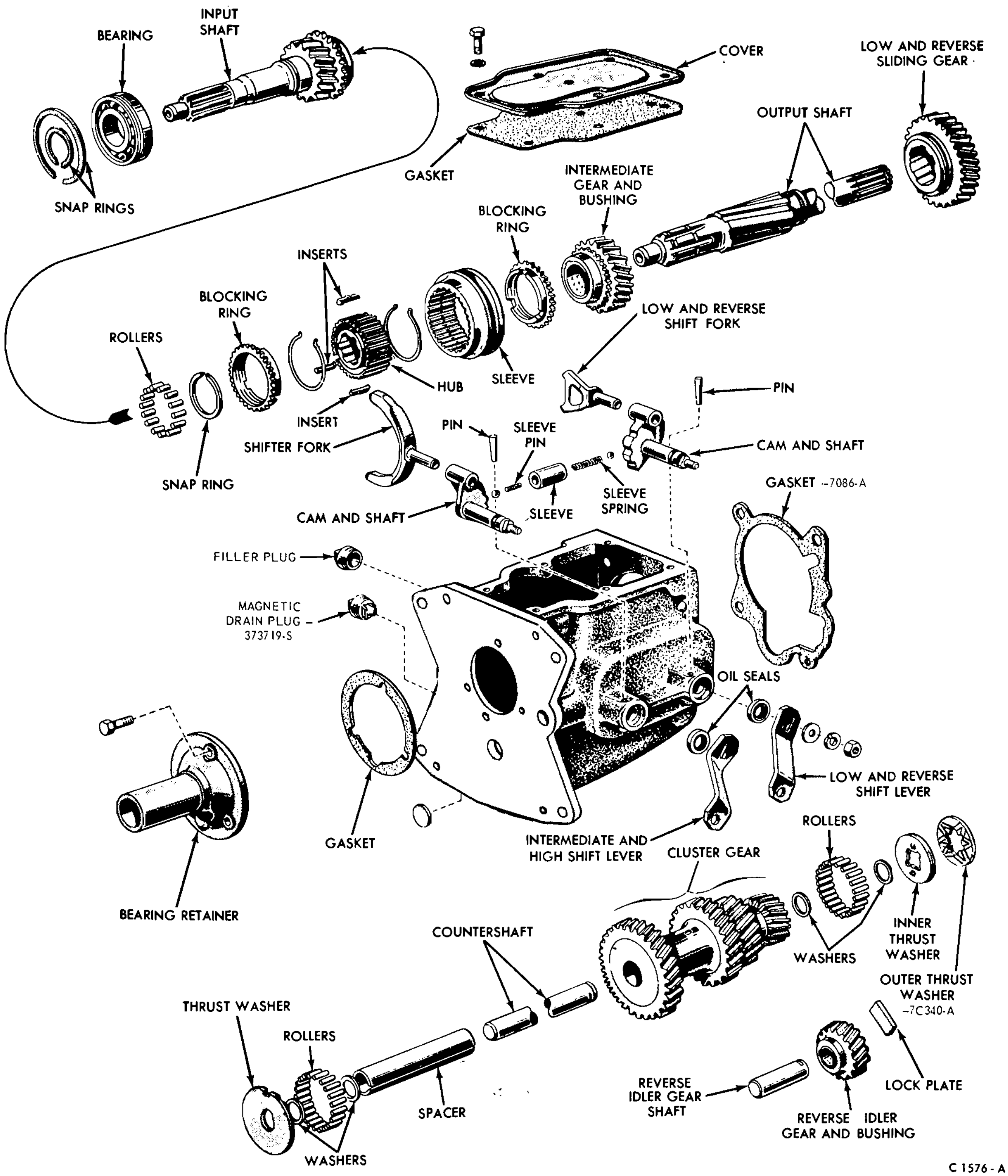


FIG. 10—Overdrive Transmission Disassembled

22. Drive the reverse idler gear shaft out of the rear of the case with a brass drift and a hammer, and remove the idler gear from the case.

23. Remove the lock plunger, spring, pin, and detent balls from the case (Fig. 14).

PARTS REPAIR OR REPLACEMENT

INPUT SHAFT BEARING

1. If the input shaft bearing is to be replaced, remove the snap ring that retains the bearing, and press the bearing and baffle off the shaft (Fig. 15).

2. Press a new bearing into place on the gear and shaft.

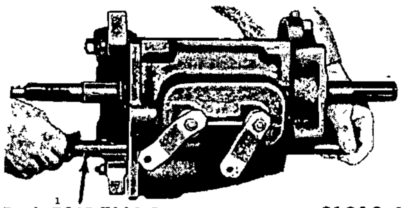


FIG. 11—Removing Countershaft

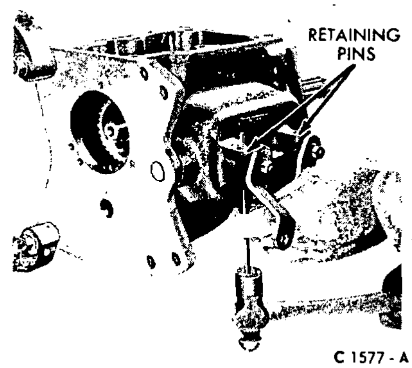


FIG. 12—Removing Shift Lever Shaft Retaining Pin

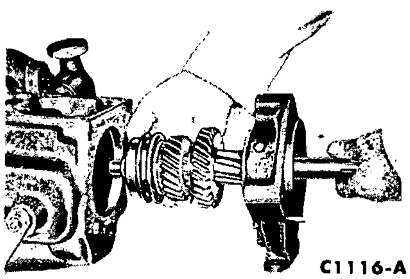


FIG. 13—Removing Output Shaft and Adapter

SYNCHRONIZER

1. Disassemble the synchronizer unit (Fig. 10) by sliding the intermediate and high sleeve off the hub. Remove the three inserts and two springs from the hub.

2. Assemble the synchronizer unit by installing the two springs on the hub and placing the three inserts in the hub. Hook one spring end in an insert as shown in Fig. 16.

3. After lining up the etched marks on the sleeve and hub splines, slide the sleeve into place on the hub.

OUTPUT SHAFT BEARING

1. Remove the snap ring which retains the output shaft in the adapter (Fig. 17), and tap the bearing out of the adapter. Remove the baffle from the adapter.

2. Remove the snap ring and press the old bearing off and the new bearing on with the tools shown in Fig. 18.

Install the snap ring to retain the bearing.

3. Position the baffle in the adapter (Fig. 17). Tap the bearing and shaft into place in the adapter.

4. Install the snap ring to retain the bearing.

CAM AND SHAFT SEALS

1. Remove the nuts and lock washers that secure the levers on the cam and shaft units, and remove the levers from the shafts and cams.

2. Remove the cams and shafts, detent balls, pin, spring, and sleeve (Fig. 10) from the case.

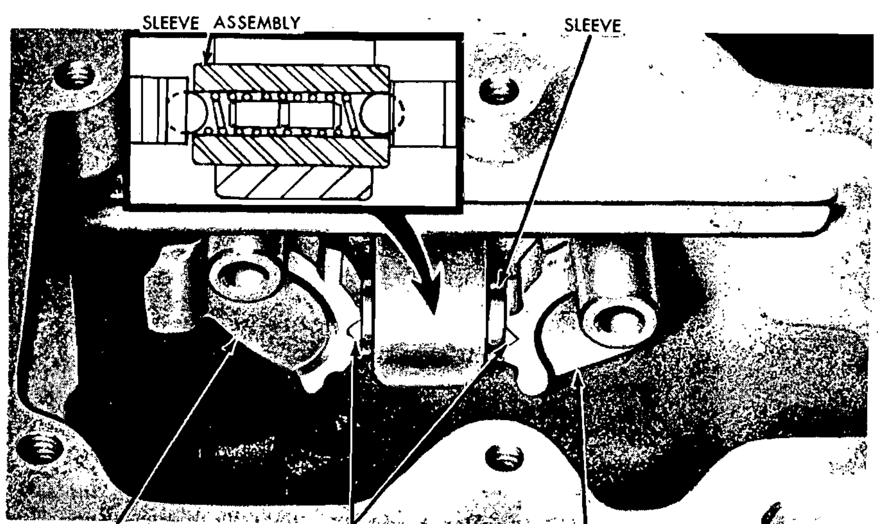


FIG. 14—Cams and Detent Balls Installed

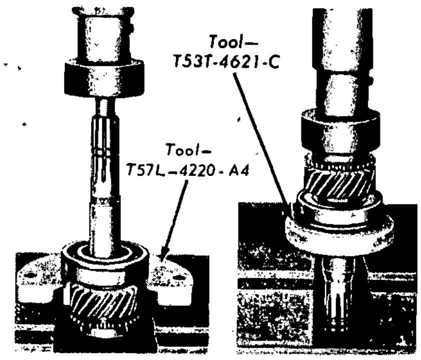


FIG. 15—Replacing Input Shaft Bearing

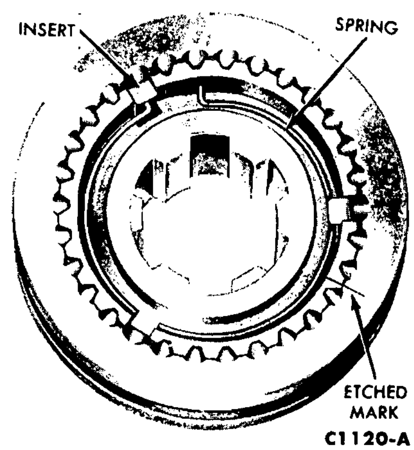


FIG. 16—Synchronizer

3. Remove the seals with a suitable puller and discard.

4. Install the new seals with a suitable driver.

5. Install the intermediate and high cam and shaft assembly in the case.

6. Insert a detent ball, sleeve, spring and pin in the bore of the case. Move the cam and shaft so that the detent ball seats in the neutral (center) notch.

7. Install the low and reverse cam and shaft assembly, and then install the levers on the shafts with nuts and lock washers.

8. Install a detent ball in the sleeve at the low and reverse end. Then push the low and reverse cam toward the detent ball far enough to hold the ball in place in the neutral notch. The ball must seat in the notch of the cam.

9. Install the shift lever shaft retaining pins (Fig. 12).

10. In order to assure positive shifting, and eliminate the possibility of engaging more than one set of gears at the same time, the clearance between the ramp of one cam and the sleeve must be checked.

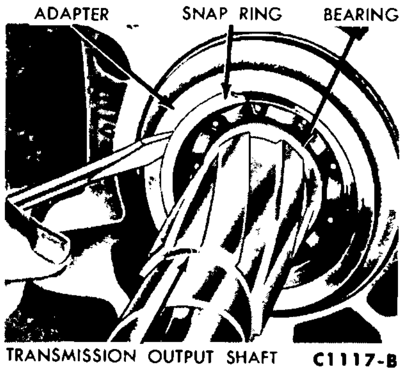


FIG. 17—Removing Output Shaft Bearing Snap Ring

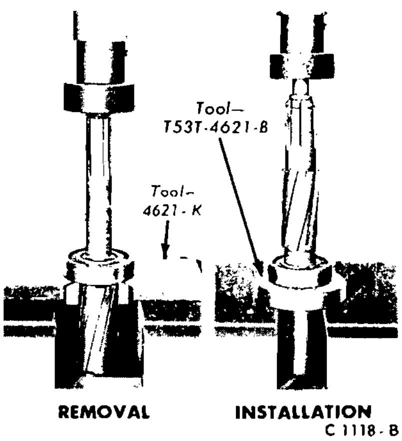


FIG. 18—Replacing Output Shaft Bearing

COUNTERSHAFT ROLLERS

1. Remove the thrush washers from each end of the countershaft.
2. Remove the dummy shaft, retainer washers, rollers, and spacer from the countershaft gear.
3. Position the spacer and the dummy shaft in the countershaft.
4. Place a retainer washer in each end of the countershaft gear.
5. Apply grease to all of the rollers and place them in each end of the countershaft gear.
6. Apply grease to the two remaining retainer washers and to the contact surface of the thrust washers. Install the retainer washers and the thrust washers on each end of the gear.

ASSEMBLY

Always use new gaskets and gasket sealer during assembly. To provide initial lubrication, apply a thin coating of lubricant on all parts before installation.

1. Position the countershaft gear, dummy shaft, and roller bearings in the case.
2. Place the case in a vertical position. Align the gear bore and the thrust washers with the bores in the case and install the countershaft.
3. Place the case in a horizontal position and check the countershaft gear end play with a feeler gauge. The end play should be within specification. If not within these limits, replace the thrust washers.
4. After establishing the correct end play, install the dummy shaft in the countershaft gear and allow the gear to remain at the bottom of the case.
5. Install the reverse idler gear in the case, with the chamfered gear teeth ends toward the front.
6. Drive the reverse idler shaft into the case, with the locking notch aligned with the countershaft hole.
7. Install the low and reverse sliding gear on the output shaft, with the shifter fork groove toward the front.
8. Install the intermediate gear on the output shaft, with the clutch teeth toward the front.
9. Place a blocking ring on the intermediate gear, and install the synchronizer assembly on the transmission output shaft, with the hub thrust surface toward the rear (Fig. 16). Install the snap ring that retains the synchronizer.
10. Install the shift forks in the cams inside the transmission case.

The offset in the low and reverse fork goes toward the front.

11. Install a new solenoid seal in the overdrive adapter.
12. Place a new gasket on the overdrive adapter and hold it in place with gasket sealer.
13. Install the overdrive adapter and transmission output shaft assembly in the transmission.
14. Engage the shift forks with the high and intermediate sleeve, and with the low and reverse sliding gear.
15. Seat the overdrive adapter squarely against the transmission case, and secure with a cap screw.
16. Coat the bore of the input shaft with a thin film of grease. A **thick film of grease will plug the lubricant hole and prevent lubrication of the bearings.** Install the pilot roller bearings.
17. Place the blocking ring on the input shaft gear and hold them in position. Move the input shaft forward to seat the output shaft pilot in the roller bearings of the input shaft.
18. Tap the input shaft and bearing into the case with a soft hammer, and at the same time line up the slots in the blocking ring with the synchronizer inserts.
19. Place a new gasket on the input shaft bearing retainer, and hold it in place with gasket sealer.

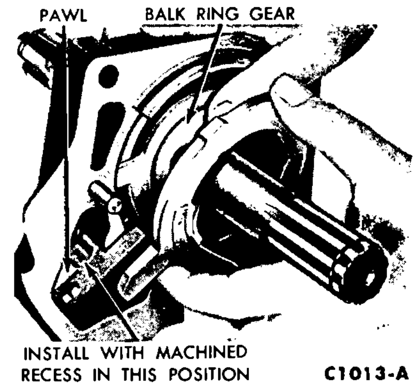


FIG. 19—Plate and Trough Installed

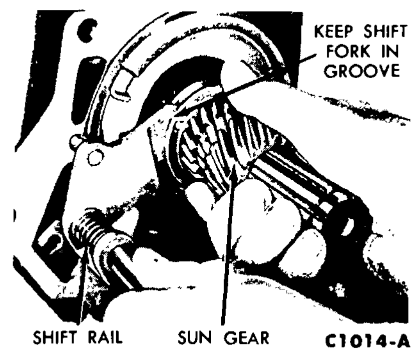


FIG. 20—Sun Gear and Shift Rail Installation

20. Install the input shaft bearing retainer to the transmission case.
21. Swing the transmission to an inverted position in the fixture.
22. Remove the cap screw holding the adapter in place. Pull the adapter outward approximately 1/4 inch, and rotate it to expose the countershaft hole.
23. Work the countershaft gear into normal position by rotating the input and output shafts.
24. Push the countershaft into the case from the rear.
25. Align the slots in the countershaft with the slot in the reverse idler shaft and install the lock plate.
26. Rotate the adapter to its normal position and set it squarely against the transmission case. Check the blocking rings to make sure the slots are aligned with the synchronizer inserts.
27. Swing the transmission so that the input shaft is pointing down.
28. Place the balk ring gear assembly and pawl in the adapter (Fig. 19).
29. Place the plate and trough assembly in the adapter and install its snap ring.

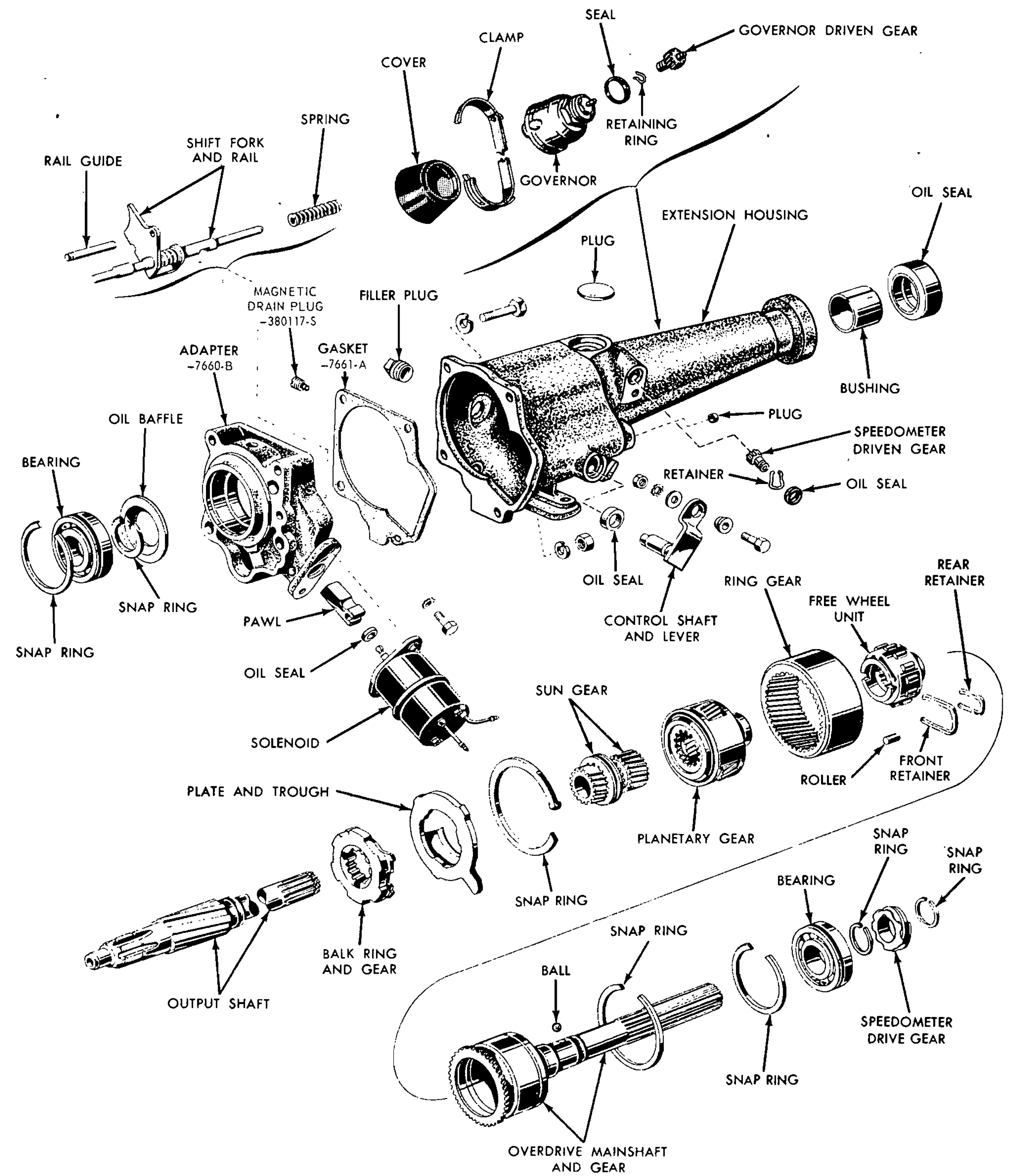


FIG. 21—Overdrive Unit Disassembled

30. Install the sun gear and shift rail (Fig. 20).

31. Install the planet carrier and the clutch cam. Install the retainers.

32. Install the 12 clutch rollers and hold them in position with a strong rubber band

33. Rotate the roller cage counterclockwise (from the rear) until the rollers are off the cam surfaces. The rubber band will hold them there.

34. Slide the overdrive output shaft carefully over the clutch rollers. The rubber band will not affect

operation of the overdrive.

35. Align the shift rail spring with the holes in the overdrive housing.

36. Place a new gasket on the overdrive adapter, and hold it in place with gasket sealer (Fig. 21).

37. Install the overdrive housing over the overdrive output shaft and shift rail.

38. If the overdrive output shaft bearing snap ring does not drop into its groove when the housing is seated squarely on the adapter, pry the overdrive output shaft bearing toward the rear, working through the snap ring hole. Install the overdrive housing attaching bolts.

39. Engage the overdrive shaft lever by pushing it inward. The lever is correctly engaged when a spring load is apparent as the lever is pushed forward.

40. Install the retaining pin in the overdrive housing to hold the control shaft in place.

41. If the overdrive housing bushing and seal are to be replaced, use the same tools which are used on conventional transmissions.

42. Thread the governor into the overdrive housing.

43. Position the solenoid in the adapter. Rotate the solenoid 1/4 turn from normal position so that the half ball on the solenoid stem can engage the pawl.

If the solenoid stem is properly engaged, the solenoid cannot be removed from the overdrive in its normal position. Any attempt to pull it out will merely compress the engaging spring in the solenoid. Install the two solenoid attaching screws.

44. Install the drain plugs in the transmission case and in the overdrive housing. Make sure the magnetic plugs are installed in the bottom of the case.

45. Place the transmission in gear. Pour lubricant over the entire gear train while rotating the input or output shaft.

46. Check the transmission gear operation in all positions.

47. Use a new cover gasket and install the transmission cover. Coat the cover attaching screws with sealer and torque them to specification.

PART 6-6—Specifications

TRANSMISSION IDENTIFICATION 3-SPEED TRANSMISSIONS

Car Model	Engine	Trans. Model	Gear Ratios 1st	2nd	Rev.
Fairlane, Merc. Inter.,	390-2V-4V	RAT-B, RAT-C	2.42	1.61	2.33
Mustang, Cougar	390-4V	RAT-N			
Falcon	200-1V	RED-A	2.76	1.69	3.74
Falcon	170-1V	RED-C	3.29	1.83	4.46

Car Model	Engine	Trans. Model	Gear Ratios 1st	2nd	Rev.
Falcon	289-2V-4V	RAN-C	2.99	1.75	3.17
Fairlane, Merc Inter.	200-1V-HD, 289-2V	RAN-C			
Mustang, Cougar	289-2V-4V	RAN-D			
Mustang	200-1V	RAN-S			
Fairlane, Merc. Inter. Ranchero	200-1V	RAN-T			

4-SPEED TRANSMISSION

Car Model	Engine	Trans. Model	Gear Ratios 1st	2nd	3rd	Rev.
Merc.Inter., Fairlane	390-2V-4V	RUG-C	2.32	1.69	1.29	2.32
Mustang	289-4V-HP	RUG-N				
Fairlane, Merc. Inter.	427-4V-8V	RUG-L				

Car Model	Engine	Trans. Model	Gear Ratios 1st	2nd	3rd	Rev.
Falcon, Merc. Inter. Fairlane	289-2V-4V	RUG-D	2.78	1.93	1.36	2.78
Mustang, Cougar	289-2V-4V	RUG-E				
Mustang, Cougar	390-4V	RUG-M				

OVERDRIVE TRANSMISSIONS

Car Model	Engine	Trans. Model	Gear Ratios 1st	2nd	O'Dr.	Rev.
Fairlane	289-2V	HEK-AK	3.20	1.86	0.70	3.80

TORQUE LIMITS (FT-LBS)

	3-Speed Transmissions	4-Speed Transmissions	Overdrive Transmission
Extension Housing Bolts	42–50	42–50	42–50
Input Shaft Bearing Retainer-to-Transmission Case Bolts	30–36	19–25	15–20
Speedometer Cable Retainer-to-Transmission Extension	3.0–4.5	3.0–4.5	–
Overdrive Assembly-to-Transmission Case Bolts	–	–	37–42
Transmission-to-Flywheel Housing Bolts	37–42	37–42	37–42
Gearshift Control Levers to Cam and Shaft Assembly Lock Nuts	18–23 ①	18–23	18–23
U-Joint Flange to Output Shaft	40–50 ②	–	–
Engine Rear Support to Extension Housing Bolts or Bracket Nut	–	–	35–40
Transmission Cover Bolts	14–19	14–19	14–19
Filler Plug-to-Case	10–20	10–20	10–20
Drain Plug-to-Case	20–30	20–30	20–30
Shift Fork-to-Shift Rail (3.03)	10–18	10–18	–
Detent Set Screw (Special)	Flush to 0.020 inch Below Top of Case		
Third and Fourth Shift Rail Detent Bolt	–	10–18	–

① 14–19 for 6-Cylinder Models ② 18–24 for 2.77 Transmission

MANUAL TRANSMISSION REFILL CAPACITIES

Manual Transmission	Approximate Capacity U.S. Measure	Imperial Measure
3–Speed 6-Cylinder	2 pts.	1-1/4 pts.
3-Speed and Overdrive 8-Cylinder and 240 Six Engine	3-1/2 pts.	3 pts.
4-Speed	4 pts.	3 pts.

CLEARANCES (INCHES)

Countershaft Gear End Play–3- and 4-Speed Ford	0.004–0.018
Reverse Idler Gear End Play–3- and 4-Speed Ford	0.004–0.018
Cam Ramp to Interlock Shift Sleeve Overdrive	0.001–0.007
3-Speed Ford (2.77)	0.001–0.013
(5) Interlock Shift Sleeves are Available (2.77) – Length	1.286–1.288

SERVICE TOOLS

Tool Numbers	Description
T50T-100A	Impact Hammer–Long
T59L-100B	Impact Hammer–Short
T58L-101A	Puller Attachment
1175AB	Grease Seal Remover
T57L-4220-A	Differential Bearing Assembly Remover
T53T-4621-B or (4621-F)	Drive Pinion Bearing Cone Replacer Front & Rear
T53T-4621-C	Drive Pinion Bearing Cone Replacer
T-4621-K	Drive Pinion Bearing Cone Replacer
T53T-4242-F11	Differential Side Bearing Cone Replacer or Input Shaft Bearing Remover
6135-G	Piston Pin Remover & Replacer
T52T-6500-DJD (6500-D)	Solid Tappet Remover or Reverse Shift Rail Pliers
T52L-7000-GAE	Extension Housing Bushing and Seal Remover Extension Housing Bushing Installer
T57T-7003-A	Transmatic Drive Bushing Replacer
T63P-7025-A	Output Shaft Bearing Remover & Replacer
T64P-7025-B	Output Shaft Bearing Remover & Replacer

SERVICE TOOLS (Continued)

Tool Numbers	Description
T-7025B	Rear Main Shaft Bearing Remover
T-7025G	Main Shaft Bearing Remover & Replacer
T57L-7111-A	Cluster Gear Roller Retainer Shaft
T60K-7111-A	Cluster Gear Roller Retainer Shaft
T62K-7111-A	Cluster Gear Roller Retainer Shaft
T64P-7111-A	Cluster Gear Roller Retainer Shaft
T56P-7111-B	Cluster Gear Roller Retainer Shaft
T63P-7111-B	Cluster Gear Roller Retainer Shaft
T64P-7140-A	Reverse Idler Shaft Remover
T57L-7657-A	Transmission Extension Housing Oil Seal Replacer
T64P-7657-A	Transmission Extension Housing Oil Seal Replacer
760K-7657-B (7657-G)	Transmission Extension Housing Oil Seal Replacer
T7688	Lockout Lever Oil Seal Replacer
T60K-7697-A	Transmission Extension Housing Bushing Remover
T57P-77047-A	Transmission Input Shaft Oil Seal Replacer –Standard Transmission
T60K-77047-A	Transmission Input Shaft Oil Seal Replacer –Standard Transmission

Automatic Transmission

GROUP 7

PART 7-1—*General Transmission Service*

1 DIAGNOSIS AND TESTING

When diagnosing transmission problems, first refer to the diagnosis guide for detailed information on the items that could be causing the problem. The following preliminary checks should be made before proceeding with other diagnosis checks.

TRANSMISSION FLUID LEVEL CHECK

1. Make sure that the vehicle is standing level. Then firmly apply the parking brake.

2. Run the engine at normal idle speed. If the transmission fluid is cold, run the engine at fast idle speed (about 1200 rpm) until the fluid reaches its normal operating temperature. When the fluid is warm, slow the engine down to normal idle speed.

3. Shift the selector lever through all positions, and place the lever at P. Do not turn off the engine during the fluid level checks.

4. Clean all dirt from the transmission fluid dipstick cap before removing the dipstick from the filler tube.

5. Pull the dipstick out of the tube, wipe it clean, and push it all the way back into the tube.

6. Pull the dipstick out of the tube again, and check the fluid level. If necessary, add enough fluid to the transmission through the filler tube to raise the fluid level to the F (full) mark on the dipstick. **Do not overfill the transmission.**

FLUID AERATION CHECK

A fluid level that is too high will cause the fluid to become aerated. Aerated fluid will cause low control pressure, and the aerated fluid may be forced out the vent.

Check the transmission fluid level. Low fluid level can affect the operation of the transmission, and may indicate fluid leaks that could cause transmission damage.

TRANSMISSION FLUID LEAKAGE CHECKS

Check the speedometer cable connection at the transmission. Leakage at the oil pan gasket often can be stopped by tightening the attaching bolts to the proper torque. If necessary, replace the gasket. Check the fluid filler tube connection at the transmission. If the filler tube O-ring seal is leaking, replace the seal.

The transmission fluid is water cooled; check the fluid lines and fittings between the transmission and the cooler in the radiator tank for looseness, wear, or damage. If leakage cannot be stopped by tightening a fitting, replace the defective parts.

Check the engine coolant in the radiator. If transmission fluid is present in the coolant, the cooler in the radiator tank is probably leaking.

The cooler can be further checked for leaks by disconnecting the lines at the cooler fittings and applying 50-75 psi air pressure to the fittings. The radiator cap must be removed when making this check to relieve the pressure on the exterior side of the

cooler. If the cooler is leaking and will not hold this pressure the cooler must be replaced. Cooler replacement is described in the Cooling Section of Group 11.

If leakage is found at either the throttle lever shaft or the manual lever shaft, replace either or both seals.

Inspect the pipe plug in the case. If the plug shows leakage, torque the plug to specification. If tightening does not stop the leaks, replace the plug.

On a C6 transmission the TV pressure port plug on the right rear side of the case must also be inspected.

When converter drain plugs leak, remove the two drain plugs with a six-point wrench. Coat the threads with FoMoCo Perfect Sealing Compound or its equivalent, and install the plugs. Torque the drain plugs to specification. **Fluid leakage from the converter housing may be caused by engine oil leaking past the rear main bearing or from oil gallery plugs. Be sure to determine the exact cause of the leak.**

Oil-soluble aniline or fluorescent dyes premixed at the ratio of 1/2 teaspoon of dye powder to 1/2 pint of transmission fluid have proved helpful in locating the source of the fluid leakage. Such dyes may be used to determine whether an engine oil or transmission fluid leak is present, or if the fluid in the oil cooler leaks into the engine coolant system. A black light, however, must be used with the fluorescent dye solution.

FLUID LEAKAGE CONVERTER AREA

In diagnosing and correcting fluid leaks in the front pump and converter area, use the following procedures to facilitate locating the exact cause of the leakage. Leakage at the front of the transmission, as evidenced by fluid around the converter housing, may have several sources. By careful observation, it is possible, in many instances, to pinpoint the source of the leak before removing the transmission from the car. The paths which the fluid takes to reach the bottom of the converter housing are shown in Fig. 1

1. Fluid leaking by the front pump seal lip will tend to move along the drive hub and onto the back of the impeller housing. Except in the case of a total seal failure, fluid leakage by the lip of the seal will be deposited on the inside of the converter housing only, near the outside diameter of the housing.

2. Fluid leakage by the outside diameter of the seal and front pump body will follow the same path as leaks by the front pump seal or may run down the face of the front pump.

3. Fluid that leaks by a front pump and converter housing to case bolts will be deposited on the inside of the converter housing only. Fluid will not be deposited on the back of the converter.

4. Leakage by the front pump to case and O-ring seal may cause fluid to be deposited on the outside lower part of the converter housing as shown in Fig. 1.

5. Fluid leakage from the converter drain plugs will appear at the outside diameter of the converter.

Engine oil leaks are sometimes improperly diagnosed as front pump seal leaks. The following areas of possible leakage should also be checked to determine if engine oil leakage is causing the problem:

(a) Leakage at the rocker arm cover (valley cover) may allow oil to flow over the converter housing or seep down between the converter housing and cylinder block causing oil to be present in or at the bottom of the converter housing.

(b) Oil gallery plug leaks will allow oil to flow down the rear face of the block to the bottom of the converter housing.

(c) Leakage by the crankshaft seal will work back to the flywheel, and then into the converter housing.

Fluid leakage from other areas, forward of the transmission could

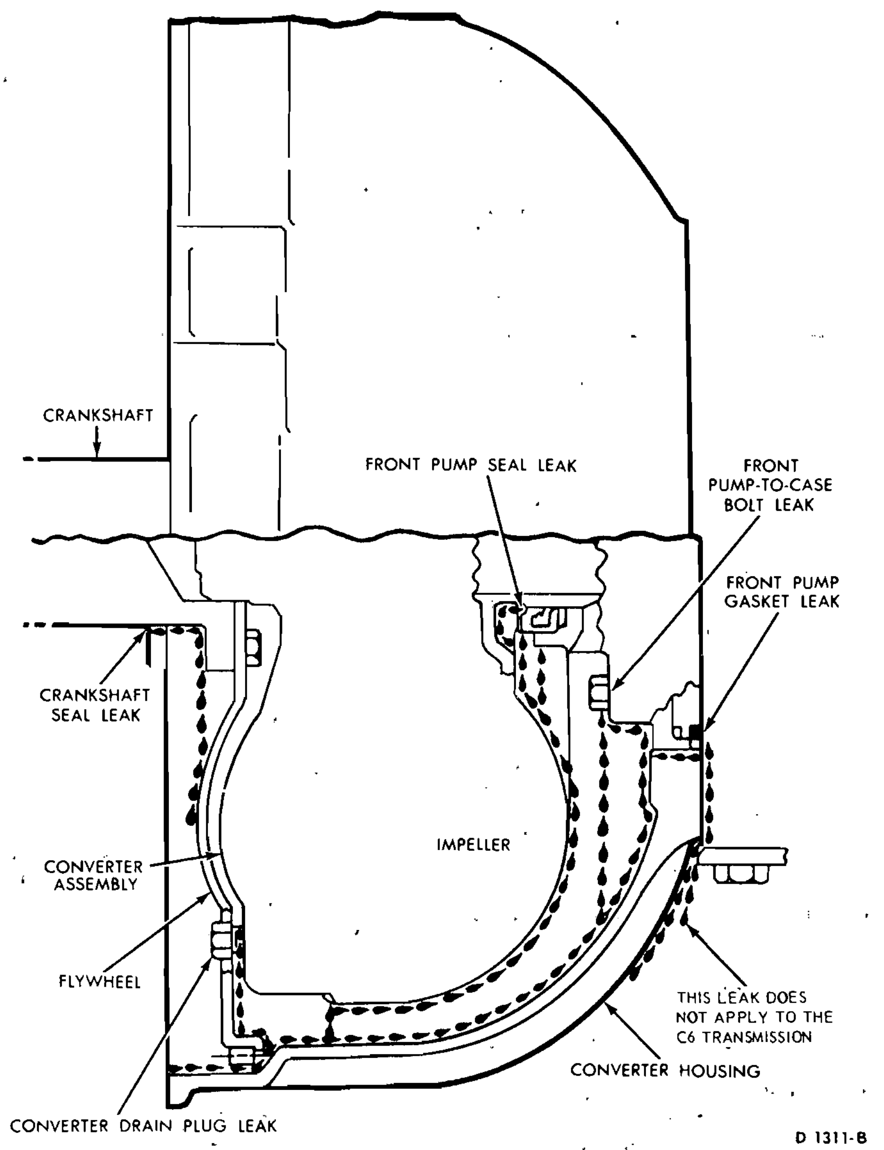


FIG. 1—Typical Converter Area Leakage Checks

cause fluid to be present around the converter housing due to blow-back or road draft.

The following procedure should be used to determine the cause of leakage before any repairs are made:

(**a**) Remove the transmission dipstick and note the color of the fluid. Original factory fill fluid is dyed red to aid in determining if leakage is from the engine or transmission. Unless a considerable amount of make-up fluid has been added or the fluid has been changed, the red color should assist in pinpointing the leak.

Since road draft may cause leaking valley cover oil to be present on the transmission, this leakage, if present, should be eliminated before performing work on the transmission.

(**b**) Remove the converter lower housing cover. Clean off any fluid from the top and bottom of the converter housing, front of the transmission case, and rear face of the engine and engine oil pan. Clean the converter area by washing with suitable non-flammable solvent, and blow dry with compressed air.

(**c**) Wash out the converter housing, the front of the flywheel, and the converter drain plugs. The converter housing may be washed out using cleaning solvent and a squirt-type oil can. Blow all washed areas dry with compressed air.

(**d**) Start and run the engine until the transmission reaches its normal operating temperature. Observe the back of the block and top of the converter housing for evidence of fluid leakage. Raise the car on a hoist and run the engine at fast idle, then at engine idle, occasionally shifting to the drive and reverse ranges to increase pressures within the transmission. Observe the front of the flywheel, back of the block (in as far as possible), and inside the converter housing (Fig. 1). Run the engine until fluid leakage is evident and the probable source of leakage can be determined.

CONVERTER LEAKAGE CHECK

During the above fluid leakage checks, if there are indications that the welds on the torque converter are leaking, the converter will have to be removed and the following check made before the unit is replaced:

A leak checking tool (Fig. 2), can be made from standard parts.

1. Install the plug in the converter (Fig. 3) and expand it by tightening the wing nut. Attach the safety chains.

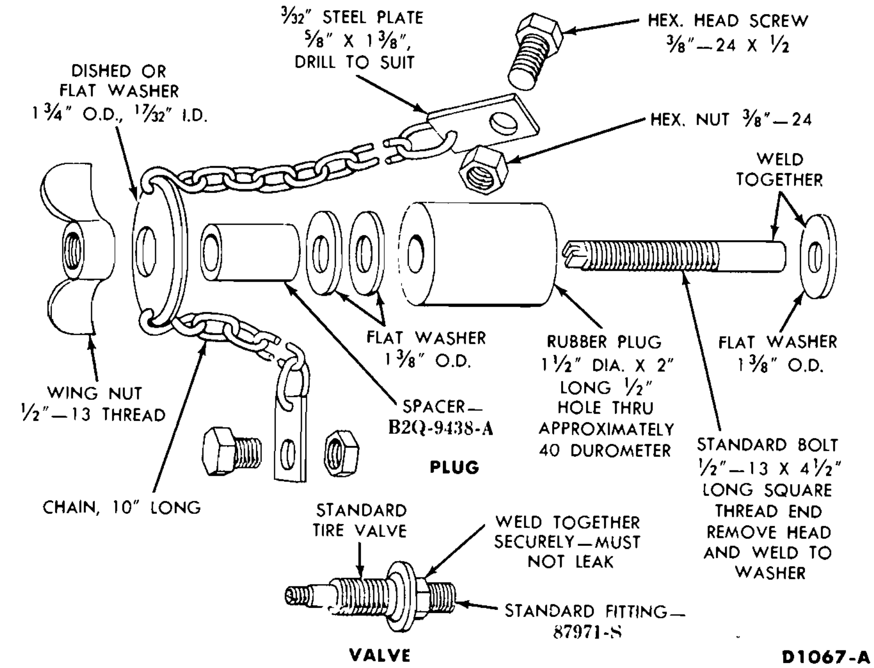


FIG. 2—Converter Leak Checking Tool

2. Install the air valve in one of the drain plug holes.

3. Introduce air pressure into the converter housing. Check the pressure with a tire gauge and adjust it to 20 psi.

4. Place the converter in a tank of water. Observe the weld areas for bubbles. If no bubbles are observed, it may be assumed that the welds are not leaking.

ENGINE IDLE SPEED CHECK

Check and, if necessary, adjust the engine idle speed, using the procedure given in Group 10.

If the idle speed is too low, the engine will run roughly. An idle speed that is too high will cause the car to creep when the transmission is shifted into gear and will cause rough transmission engagement.

ANTI-STALL DASHPOT CLEARANCE CHECK

After the engine idle speed has been properly adjusted, check the anti-stall dashpot clearance. Follow the procedure given in Group 10 for checking and adjusting this clearance.

MANUAL LINKAGE CHECKS

Correct manual linkage adjustment is necessary to position the manual valve for proper fluid pressure direction to the different transmission components. Improperly adjusted manual linkage may cause cross-leakage and subsequent transmission failure. Refer to Linkage Adjustments for detailed manual linkage adjustment procedures.

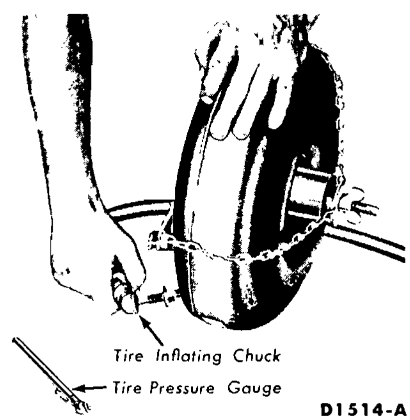


FIG. 3—Typical Converter Leak Checking Tool

CONTROL PRESSURE AND VACUUM DIAPHRAGM UNIT CHECK

When the vacuum diaphragm unit (Fig. 4) is operating properly and the downshift linkage is adjusted properly, all the transmission shifts (automatic and kickdown) whould occur within the road speed limits specified in the Specification Section.

If the automatic shifts do not occur within limits or the transmission slips during shift points, the following procedure is suggested to separate engine, transmission, linkage, and diaphragm unit or valve body problems.

1. Attach a tachometer to the engine and a vacuum gauge to the transmission vacuum line at the vacuum unit (Fig. 5).

2. Attach a pressure gauge to the control pressure outlet at the transmission (Fig. 6).

3. Firmly apply the parking brake and start the engine.

4. Adjust the engine idle speed to the specified rpm. If the engine idle speed cannot be brought within limits by adjustment at the carburetor idle adjustment screw, check the throttle and downshift linkage for a binding condition. If the linkage is satisfactory, check for vacuum leaks in the transmission diaphragm unit (Fig. 7), and its connecting tubes and hoses. Check all other vacuum operated units for vacuum leaks.

VACUUM UNIT CHECK

To check the vacuum unit for diaphragm leakage, remove the unit from the transmission. Use a distributor tester equipped with a vacuum pump (Fig. 7). Set the regulator knob so that the vacuum gauge reads 18 inches with the end of the vacuum hose blocked off.

Then connect the vacuum hose to the transmission vacuum unit. If the gauge still reads 18 inches, the vacuum unit diaphragm **is not leaking.** As the hose is removed from the transmission vacuum unit, hold a finger over the end of the control rod. When the hose is removed, the internal spring of the vacuum unit should push the control rod outward.

CONTROL PRESSURE TESTS

The test results of the following checks should agree with the specifications given in Figures 8 and 9. When performing control pressure tests, make certain that the service brake pedal is held in the applied position.

TEST NUMBER 1—CONTROL PRESSURE CHECK AT ENGINE IDLE

1. With the transmission in neutral, and at the correct engine idle, the vacuum gauge should show a minimum of 18 inches at sea level. If the vacuum reading is lower than 18 inches, an engine problem is indicated or there is leakage in the vacuum line. Make necessary repairs to obtain a minimum vacuum reading of 18 inches.

At engine idle, check the transmission control pressure gauge at all selector lever positions. Transmission control pressures should agree with the specifications shown in Figures 8 and 9.

At altitudes above sea level, it may not be possible to obtain 18 inches vacuum at engine idle. At these altitudes with idle vacuum of less than 18 inches, refer to the following specifications to determine idle speed control pressure in forward driving ranges.

2. At engine idle, depress and release the accelerator pedal quickly and observe the vacuum gauge. The amount of vacuum should decrease and increase with the changes in throttle openings. If the vacuum response to changes in throttle opening is too slow the vacuum line to the diaphragm unit could be restricted. **Make the necessary repairs before completing the test.**

TEST NUMBER 2—CONTROL PRESSURE CHECK AT 10 INCHES OF VACUUM

A control pressure check should be made at 10 inches of vacuum in D, 2, and 1. Advance the throttle until the engine vacuum reading is 10 inches and check the control pressure regulation. Control pressure should be as shown in Figures 8 and 9.

TEST NUMBER 3—CONTROL PRESSURE CHECK BELOW 1.0 INCHES OF VACUUM—C4 AND C6 TRANSMISSION

Check control pressure below 1.0 inches of vacuum in D, 2, and 1.

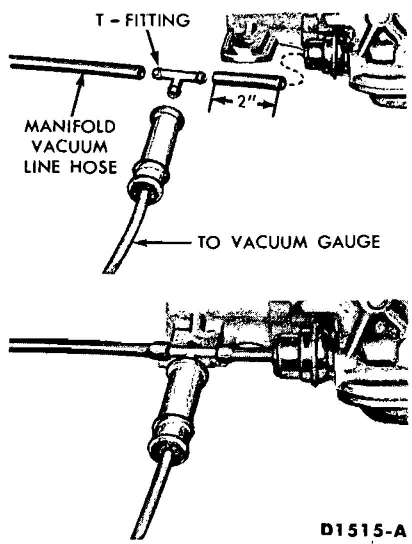


FIG. 5—Typical Vacuum Test Line Connections

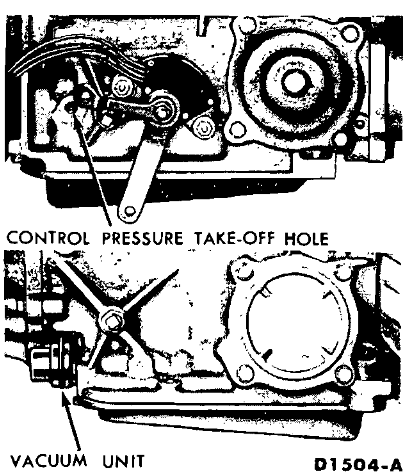


FIG. 4—Vacuum Diaphragm and Control Pressure Connecting Point—C4 Transmission

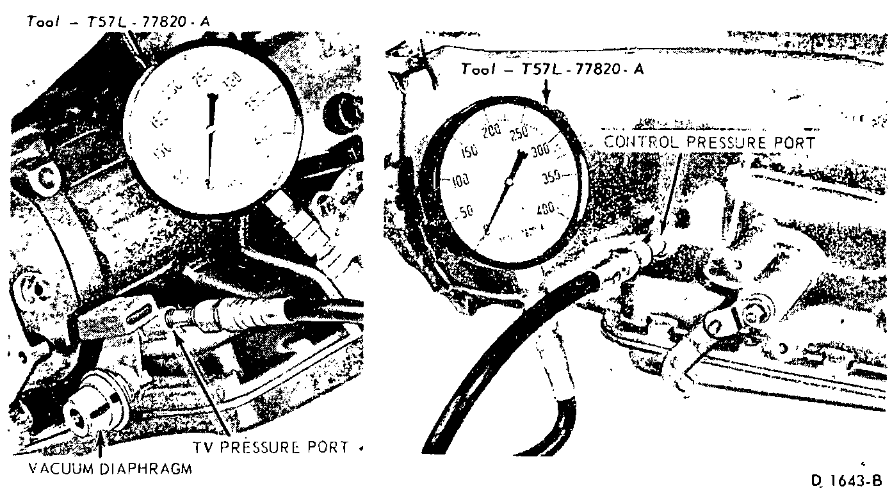


FIG. 6—Vacuum Diaphragm and Control and TV Pressure Connecting Points—C6 Transmission

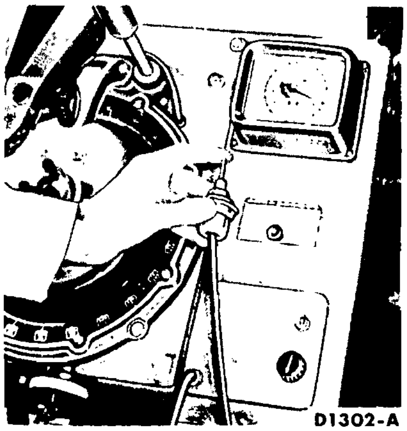


FIG. 7–**Testing Transmission Vacuum Unit For Leakage**

The control pressure should be as shown in Figures 8 and 9. Then move the selector lever to R. With the vacuum at 1.0 inch or less the control pressure should be as shown in Figures 8 and 9.

While making this pressure test, do not hold the throttle open for more than five seconds in each detent position. Between each test move the selector lever to neutral and run the engine at 1000 rpm for fifteen seconds to cool the converter.

If the vacuum and pressure gauge readings are within specifications, the diaphragm unit and transmission control pressure regulating system are operating properly.

If the transmission control pressure is too low, too high, fails to rise with throttle opening, or is extremely erratic, use the procedure given under the following appropriate heading to resolve the problem.

CONTROL PRESSURE TEST RESULTS

TEST NUMBER 1—CONTROL PRESSURE IS LOW AT ENGINE IDLE

If control pressure at engine idle is low in all selector lever positions, trouble other than the diaphragm unit is indicated.

When control pressure at engine idle is low in all ranges, check for excessive leakage in the front oil pump, case, and control valve body, or a sticking control pressure regulator valve.

TEST NUMBER 1—CONTROL PRESSURE IS HIGH AT ENGINE IDLE

If transmission control pressure at engine idle is too high in all ranges, the trouble may be in the diaphragm unit or its connecting vacuum tubes and hoses, throttle valve, or control rod.

With the engine idling, disconnect the hose from the diaphragm unit and check the engine manifold vacuum. Hold a thumb over the end of the hose and check for vacuum. If

Engine Speed	Throttle	Manifold Vac. Ins. Hg	Range	P.S.I.
Idle	Closed	(1) Above 18	P, N, D. 2, 1 R	55–61 55–113 55–202
As Required	As Required	10	D, 2, 1	93–104
As Required	As Required	Below 1.0	D, 2, 1 R	137–150 245–268

(1) At altitudes above sea level, it may not be possible to obtain 18 inches of engine vacuum at idle. For idle vacuums of less than 18 inches, refer to the following table to determine idle speed pressure specification in D driving range.

Engine Vacuum	Line Pressure
17 inches	55–66
16 inches	55–71
15 inches	55–76
14 inches	55–81
13 inches	55–86
12 inches	55–91
11 inches	55–96

FIG. 8—Control Pressure at Zero Governor RPM — C4 Transmission

Engine Speed	Idle		As Required			As Required		
Throttle	Closed		As Required			As Required		
Manifold Vacuum (Inches Hg)	Above 18 (1)		10			Below 1.0		
Range	Control Pressure (psi)		TV Pressure (psi)	Control Pressure (psi)	TV Pressure (psi)	Control Pressure (psi)		TV Pressure (psi)
	P, N, D, 2, 1	R		D, 2, 1		D, 2, 1	R	
psi @ Barometric Pressure 29.5 Sea Level	40–61	60–93	0–10	100–114	40–44	154–180	234–275	77–87

(1) It may not be possible to obtain 18 inches of engine vacuum at idle. For idle vacuums of less than 18 inches the following table provides idle speed pressure specifications in D range:

Manifold Vacuum	T.V.	Cont.
17	11–14	55–68
16	15–18	55–75
15	20–22	55–81
14	23–26	55–87
13	28–31	55–94
12	32–35	55–100
11	36–40	55–108

FIG. 9—Control Pressure at Zero Governor RPM — C6 Transmission — Non Altitude Compensating Type

the engine speeds up when the hose is disconnected and slows down as the thumb is held against the end of the hose, the vacuum source is satisfactory.

Stop the engine, and remove the diaphragm unit and the diaphragm unit control rod. Inspect the control rod for a bent condition and for corrosion. Check the diaphragm unit for leakage with the distributor tester.

TESTS NUMBER 2 AND 3—CONTROL PRESSURE NOT WITHIN LIMITS AT 10 OR AT 1.0 INCH OR LESS (C4 AND C6)

If idle pressure is within specifications but pressures at 10 or 1.0 inch or less on the C4 and C6 transmissions are not within specification in all ranges, excessive leakage, low pump capacity, or a restricted oil pan screen is indicated.

If pressures are not within specifications for specific selector lever positions only, this indicates excessive leakage in the clutch or servo circuits used in those ranges.

When the control pressure is within specifications at engine idle, **but not within specifications**, at 10 inches or 1.0 or less on the C4 and C6 transmission, the vacuum diaphragm unit may need adjustment.

The vacuum diaphragm assembly used on the C4 or C6 Automatic transmission has an adjusting screw in the vacuum hose connecting tube (Fig. 10). The inner end of the screw bears against a plate which in turn bears against the vacuum diaphragm spring.

All readings slightly high or all readings slightly low may indicate the vacuum unit needs adjustment to correct a particular shift condition.

For example, on a C4 transmission, if the pressure at 10 inches of vacuum was 120 psi or high at 1.0 or below and upshifts and downshifts were harsh, a diaphragm adjustment to reduce the diaphragm assembly spring force would be required.

If pressure readings are low, an adjustment to increase diaphragm spring force is required.

To increase control pressure, turn the adjusting screw in clockwise. To reduce control pressure, back the adjusting screw out by turning it counterclockwise.

One complete turn of the adjusting screw (360°) will change idle line control pressure approximately 2-3 psi. After adjustment is made, install the vacuum line and recheck the pressures, particularly the pressure at 10 inches of vacuum.

The diaphragm should not be adjusted to provide pressures below the ranges previously specified in order to change shift feel. To do so could result in soft or slipping shifts and damage to the transmission.

HYDRAULIC CONTROL SYSTEM TESTS—C6 TRANSMISSION

In general, diagnosis and test procedures which apply to the C4 transmission will also apply to the C6. One of the most important aspects of diagnosis is understanding the correct and proper functioning of the transmission, so that when improper operation occurs, the cause can be quickly isolated. For example, in the hydraulic control system (Fig. 10, Part 7-3) the following test procedures can be applied to isolate certain valves in the C6 transmission which may be suspected of improper operation.

PRIMARY THROTTLE VALVE AND REGULATOR VALVE

With pressure gauge installed to line pressure outlet, and vacuum gauge installed in T at diaphragm, check line pressure readings against specifications. If readings are consistent and fall within specifications, it can be assumed that the diaphragm, throttle valve, and regulator valve are functioning properly. If control pressures do not fall within the specified ranges, are erratic or proper pressures cannot be obtained by a diaphragm adjustment, the pressure regulator valve can be isolated by checking primary TV pressure. Install the pressure gauge to the primary TV pressure outlet and check TV pressure vs. vacuum as shown in specifications; if TV pressures are within specification, or can be brought within specification with a diaphragm adjustment it can be assumed that the primary throttle valve, its circuit and the vacuum diaphragm are operating properly.

If TV pressures cannot be brought within specifications, or are erratic, the problem could be in the regulator valve (due to its inability to supply sufficient pressure to the throttle valve) or in the throttle valve, diaphragm or vacuum lines. In these circumstances diagnostic and test procedures for the diaphragm, lines, etc. should be applied.

CUTBACK CONTROL VALVE COASTING BOOST VALVE AND GOVERNOR VALVES

A series of tests can be applied which will determine if the cutback control valve, coasting boost valve and governor valves are functioning.

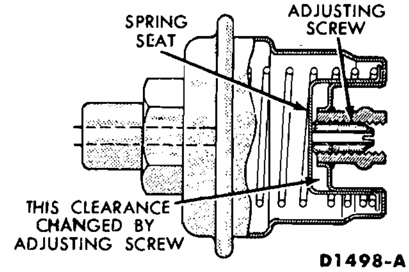


FIG. 10—Adjustable Vacuum Unit

With a pressure gauge connected to read line pressure, the vehicle should be driven and the shift points checked. If the transmission shifts at the specified road speeds, it can be assumed that the governor is working properly. If the governor is working properly but line pressure cutback is delayed or does not occur, the cutback control valve is at fault. If the cutback control valve is sticking in the closed (up) position, primary TV pressure is being delivered to both the end and the first valley of the pressure booster valve, and no cutback will occur. Line cutback should occur at or shortly before the 1-2 shift. If the valve is sticking in the closed (down) position, the primary TV pressure passages to the pressure booster valve are open to exhaust, and there will be no boost in line pressure. The start of boost in line pressure should occur between 17 and 15 inches manifold vacuum. This condition would also result in low stall pressures.

The coasting boost valve operation can be checked as follows: with the vehicle coasting at a speed above 55 MPH, the selector lever should be moved to the 1 position; if the coasting boost valve is operating properly, an increase in line pressure will be noted. As speed drops below approximately 55 MPH, a drop in line pressure should be noted, indicating that the boost valve and governor are operating properly. If line pressure does not respond as described, either the governor or the coasting boost valve is at fault. If shift points indicate that the governor is operating correctly and other control pressures check out to specification then the problem is due to a sticking or inoperating coasting boost valve.

STALL TEST

Start the engine to allow it to reach its normal temperature. Apply both the parking and service brakes while making tests.

The stall test is made in D, 2, 1 or R, at full throttle to check engine performance, converter clutch operation or installation, and the holding ability of the forward clutch, reverse-high

clutch and low-reverse band and the gear train one-way clutch. **While making this test, do not hold the throttle open for more than five seconds at a time.** Then move the selector lever to Neutral and run engine at 1000 rpm for about 15 seconds to cool the converter before making the next test. If the engine speed recorded by the tachometer exceeds the maximum limits shown in Figure 11, release the accelerator immediately because clutch or band slippage is indicated.

STALL SPEED TOO HIGH

If stall speed exceeds specifications, band or clutch slippage is indicated, depending on transmission selector lever position. Excessive engine rpm only in D, 2 and 1 indicates forward clutch slippage. Excessive engine rpm only in R indicates either reverse-high clutch or low-reverse band slippage in the C4 transmission, and either reverse-high or low-reverse slippage in the C6 transmission. Excessive engine rpm only in D indicates gear train one-way clutch slippage.

STALL SPEED TOO LOW

When the stall test speeds are low and the engine is properly tuned, converter stator clutch problems are indicated. A road test must be performed to determine the exact cause of the trouble.

If the stall test speeds are 300 to 400 rpm below the specifications shown in Figure 11, and the car cruises properly but has very poor acceleration, the converter stator clutch is slipping.

If the stall test speeds are 300 to 400 rpm below the specified values, and the car drags at cruising speeds and acceleration is poor, the stator clutch could be installed backwards.

Remove the converter and check the stator clutch as described in Cleaning and Inspection.

When the stall test shows normal speeds, the acceleration is good, but the car drags at cruising speeds, the difficulty is due to a seized stator assembly. If the stator is defective, replace the converter.

INITIAL ENGAGEMENT CHECKS

Initial engagement checks are made to determine if initial band and clutch engagements are smooth.

Run the engine until its normal operating temperature is reached. With the engine at the correct idle speed, shift the selector lever from N to 2, D, 1, and R. **Observe the initial band and clutch engagements.** Band and clutch engagements should be smooth in all positions. Rough initial engagements in D, 2, 1, or R are caused by high engine idle speed or high control pressures.

Engine Model CID	Engine Speed (rpm)	Transmission Type
170-1V	1400–1600 ①	C4
200-1V	1550–1750 ①	C4
289-2V	1750–1950 ①	C4
289-4V	1750–1950 ① ②	C4
289-4V	1800–2000 ① ③	C4
289-4V HP	1750–1950 ①	C4
390-2V	1700–1900	C6
390-4V	1750–1950	C6
390-4V GT	1700–1900	C6

① For thermactor equipped engines, subtract 50 rpm.
② With single exhaust systems.
③ With dual exhaust systems.

FIG. 11—Stall Speed Limits

SHIFT POINT CHECKS

Check the light throttle upshifts in D. The transmission should start in first gear, shift to second, and then shift to third within the shift points specified in the specifications section.

While the transmission is in third gear, depress the accelerator pedal through the detent (to the floor). The transmission should shift from third to second or third to first, depending on the car speed.

Check the closed throttle downshift from third to first by coasting down from about 30 mph in third gear. The shift should occur within the limits specified in the specifications section.

When the selector lever is at 2, the transmission can operate only in second gear.

With the transmission in third gear and road speed over 30 mph, the transmission should shift to second gear when the selector lever is moved from D to 2 or 1. The transmission will downshift from second or third to first gear when this same manual shift is made below approximately 25 mph with a C4 transmission or approximately 30 mph with a C6 transmission. **This check will determine if the governor pressure and shift control valves are functioning properly.**

During the shift check operation, if the transmission does not shift within specifications or certain gear ranges cannot be obtained, refer to the Diagnosis Guide to resolve the problem.

AIR PRESSURE CHECKS

A NO DRIVE condition can exist, even with correct transmission fluid pressure, because of inoperative clutches, bands. The inoperative units can be located through a series of checks by substituting air pressure for the fluid pressure to determine the location of the malfunction.

When the selector lever is at 2, a NO DRIVE condition may be caused by an inoperative forward clutch. A NO DRIVE condition at D may be caused by an inoperative forward clutch or one-way clutch. When there is no drive in 1, the difficulty could be caused by improper functioning of the forward clutch or low-reverse band and the one-way clutch in a C4, or the forward clutch or low-reverse and one-way clutches in the C6 transmission. The low-reverse band in the C4 transmission and low-reverse in the C6 transmission cannot be checked in 1. If the low-reverse band or clutch fails, the one-way clutch will hold the gear train and operation will be normal except that there will be no engine braking. Failure to drive in reverse range could be caused by a malfunction of the reverse-high clutch or low-reverse band in the C4 transmission, or the low-reverse clutch or the reverse-high clutch in the C6 transmission. Erratic shifts could be caused by a stuck governor valve.

To make the air pressure checks, drain the transmission fluid, and then remove the oil pan and the control valve body assembly. The inoperative units can be located by introducing air pressure into the transmission case passages leading to the clutches, servos, and governor.

FORWARD CLUTCH

Apply air pressure to the transmission case forward clutch passage (Fig. 12). A dull thud can be heard when the clutch piston is applied. If no noise is heard, place the finger tips on the input shell and again apply air pressure to the forward clutch passage. Movement of the piston can be felt as the clutch is applied.

GOVERNOR

Apply air pressure to the control pressure to governor passage and listen for a sharp clicking or whistling noise. The noise indicates secondary governor valve movement.

REVERSE-HIGH CLUTCH

Apply air pressure to the reverse-high clutch passage (Fig. 12). A dull thud indicates that the reverse-high clutch piston has moved to the applied position. If no noise is heard, place the finger tips on the clutch drum and again apply air pressure to detect movement of the piston.

INTERMEDIATE SERVO

Hold the air nozzle in the intermediate servo apply passage (Fig. 12). Operation of the servo is indicated by a tightening of the intermediate band around the drum. Continue to apply air pressure into the intermediate servo apply passage, and introduce air pressure into the intermediate servo release passage. The intermediate servo should release the band against the apply pressure.

LOW-REVERSE CLUTCH— C6 TRANSMISSION

Apply air pressure to the low-reverse clutch apply pressure passage. A dull thud indicates that the piston has moved to the apply position. If no thud is heard, apply air pressure again while holding the palm of the hand on the exterior at the rear of the case to detect clutch apply movement.

LOW-REVERSE SERVO— C4 TRANSMISSION

Apply air pressure to the low-reverse apply passage (Fig. 12). The low-reverse band should tighten around the drum if the servo is operating properly.

If the servos do not operate, disassemble, clean and inspect them to locate the source of the trouble.

If air pressure applied to any clutch passage fails to operate the clutch or operates more than one clutch at once, remove and, with air pressure, check the fluid passages in the case and front pump to detect obstructions.

If the passages are clear, remove the clutch assemblies, and clean and inspect the malfunctioning clutch to locate the trouble.

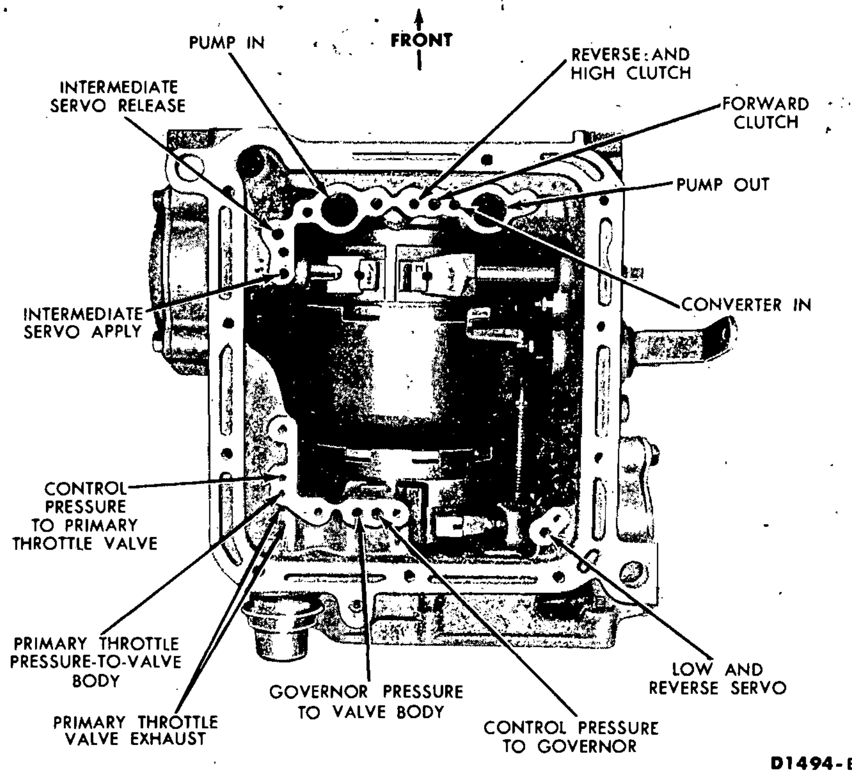


FIG. 12—Oil Pressure Passage Holes

DIAGNOSIS GUIDE

The Transmission Diagnosis Guide (Figs. 17 and 18) lists the most common trouble symptoms that may be found in the transmission, and gives the items that should be checked to find the cause of the trouble.

The items to check for each trouble symptom are arranged in a logical sequence which should be followed for quickest results. The letter symbols for each item are explained in the Key to the Diagnosis Guide.

If items A, B, C, D, E, and the stall test have already been checked during the preliminary checks and adjustments, they need not be repeated when following the Diagnosis Guide.

2 COMMON ADJUSTMENTS AND REPAIRS

TRANSMISSION FLUID DRAIN AND REFILL

Normal maintenance and lubrication requirements do not necessitate periodic automatic transmission fluid changes.

If a major failure, such as a clutch, band, bearing, etc., has occurred within the transmission, it will have to be removed for service. At this time the converter, transmission fluid cooler and cooler lines must be thoroughly flushed to remove all dirt.

When filling a dry transmission and converter, install 5 quarts of fluid. Start the engine, shift the selector lever as in Step 5 below, and check and add fluid as necessary.

Following is the procedure for partial drain and refill due to minor repairs.

1. Place a drain pan under the transmission. Loosen and remove all but two of the oil pan bolts, from the front of the case and drop the rear edge of the oil pan to drain the fluid. Remove and thoroughly clean the oil pan and screen. Discard the oil pan gasket.

2. Place a new gasket on the oil pan, and install the screen and pan on the transmission.

3. Add three quarts of fluid to the transmission through the filler tube.

4. Run the engine at idle speed for about two minutes. Check the fluid level, and add fluid if necessary. Run the engine at fast idle speed (about 1200 rpm) until it reaches its normal operating temperature. **Do not race the engine.**

5. Shift the selector lever through all the positions, place it at P, and check the fluid level. If necessary, add enough fluid to the transmission to raise the level to the F (Full) mark on the dipstick. **Do not overfill the transmission.**

OIL COOLER FLUSHING PROCEDURE

When a clutch or band failure or other internal trouble has occurred in the transmission, any metal particles or clutch plate or band material that may have been carried into the cooler should be removed from the system by flushing the cooler and lines before the transmission is put back into service. In no case should an automatic transmission having a clutch or band failure or other internal trouble resulting in fluid contamination, be put back into service without first flushing the transmission oil cooler.

1. After installing a new or rebuilt automatic transmission and converter assembly in the car, **Do Not Connect the Cooler Return Line to the Transmission.** Place the transmission selector lever in the P (park) position and connect the cooler inlet (converter out) line to the transmission. Place a pan under the end of the cooler return line that will hold transmission fluid. **Do Not Start the Engine.**

2. Install 5 quarts of automatic transmission fluid meeting Ford Specification.

3. Start the engine and allow it to run at normal idle speed for 3 minutes with the selector lever in P (park) position. Stop the engine and add additional transmission fluid required to complete total fill. Start the engine and allow it to run at normal idle speed.

4. Allow approximately two quarts of transmission fluid to drain into the pan placed under the end of the cooler return line.

5. If the fluid does not run clean after draining two quarts of it through the cooler, shut off the engine and add **two additional quarts** of transmission fluid.

6. Repeat steps 3 through 5 until the transmission fluid flowing out of the cooler return line is clean.

7. If there is no fluid flow or the fluid does not flow freely, shut off the engine and disconnect both cooler lines from the transmission and cooler.

8. Use an air hose with not more than 100 psi air pressure to reverse flush the cooler lines and the cooler. After reverse flushing, connect both lines at the cooler and the cooler inlet line (converter out) to the transmission.

9. Start the engine and check the fluid flow. If the transmission fluid flows freely, proceed with steps 3 through 6. If there is no fluid flow, check for pinched cooler lines. If the flow is restricted, replace cooler lines and/or the radiator.

10. Shut off the engine, and connect the cooler return line to the transmission. Check the transmission fluid level as indicated under heading Transmission Fluid Level Check. Add or remove transmission fluid as required until the proper fluid level is obtained on the dipstick. DO NOT OVERFILL THE TRANSMISION.

11. **Do not attempt to correct cooler or cooler line leaks by closing off the lines.**

OIL COOLER TUBE REPLACEMENT

When fluid leakage is found at the oil cooler, the cooler must be replaced. Cooler replacement is described in the Cooling System Section of Group 11.

When one or more of the fluid cooler steel tubes must be replaced, each replacement tube must be fabricated from the same size steel tubing as the original line.

Using the old tube as a guide, bend the new tube as required. Add the necessary fittings, and install the tube.

After the fittings have been tightened, add fluid as needed, and check for fluid leaks.

THROTTLE AND DOWNSHIFT LINKAGE

Lubricate the throttle linkage with 10W engine oil. Lubricate the lower pivot point of the downshift rod with C1AZ-19590-A moly lube (ball joint grease).

3 CLEANING AND INSPECTION

CLEANING

TRANSMISSION

Clean all parts with suitable solvent and use moisture-free air to dry off all parts and clean out the various fluid passages.

The composition clutch plates, synthetic seals and bands should not be cleaned in a vapor degreaser or with any type of detergent solution. To clean these parts, wipe them off with a lint-free cloth. New clutch plates and bands should be soaked in transmission fluid for fifteen minutes before they are assembled.

CONVERTER

The converter cannot be disassembled for cleaning. If there is reason to believe that the converter has an excessive amount of foreign material in it, the following cleaning procedure should be used:

1. Thoroughly clean the outside surfaces of the converter. Remove both drain plugs and drain as much fluid as possible.

2. Check the converter as detailed under Inspection.

3. Place the converter on the cleaning machine with the drain holes facing downward.

4. Flush the inside diameter of the converter hub for one minute using the equipment jog switch to control the pump pressure.

5. Install the filler cap on the converter. Place the converter on the mounting pad with the drain holes facing upward.

6. Connect the pump pressure line to the filler cap. Fill the converter to the drain hole level, then install the filler plugs finger tight.

7. Turn the converter over on the mounting pad so that the drain plugs are facing downward and are 90° to the cross-bar. Secure the converter with the cross-bar.

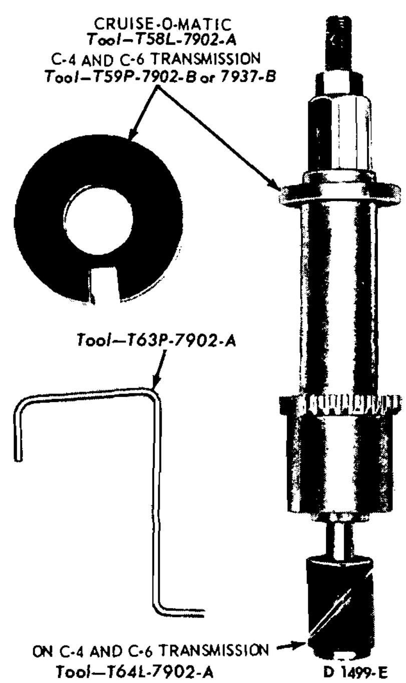


FIG. 13—Converter Checking Tool

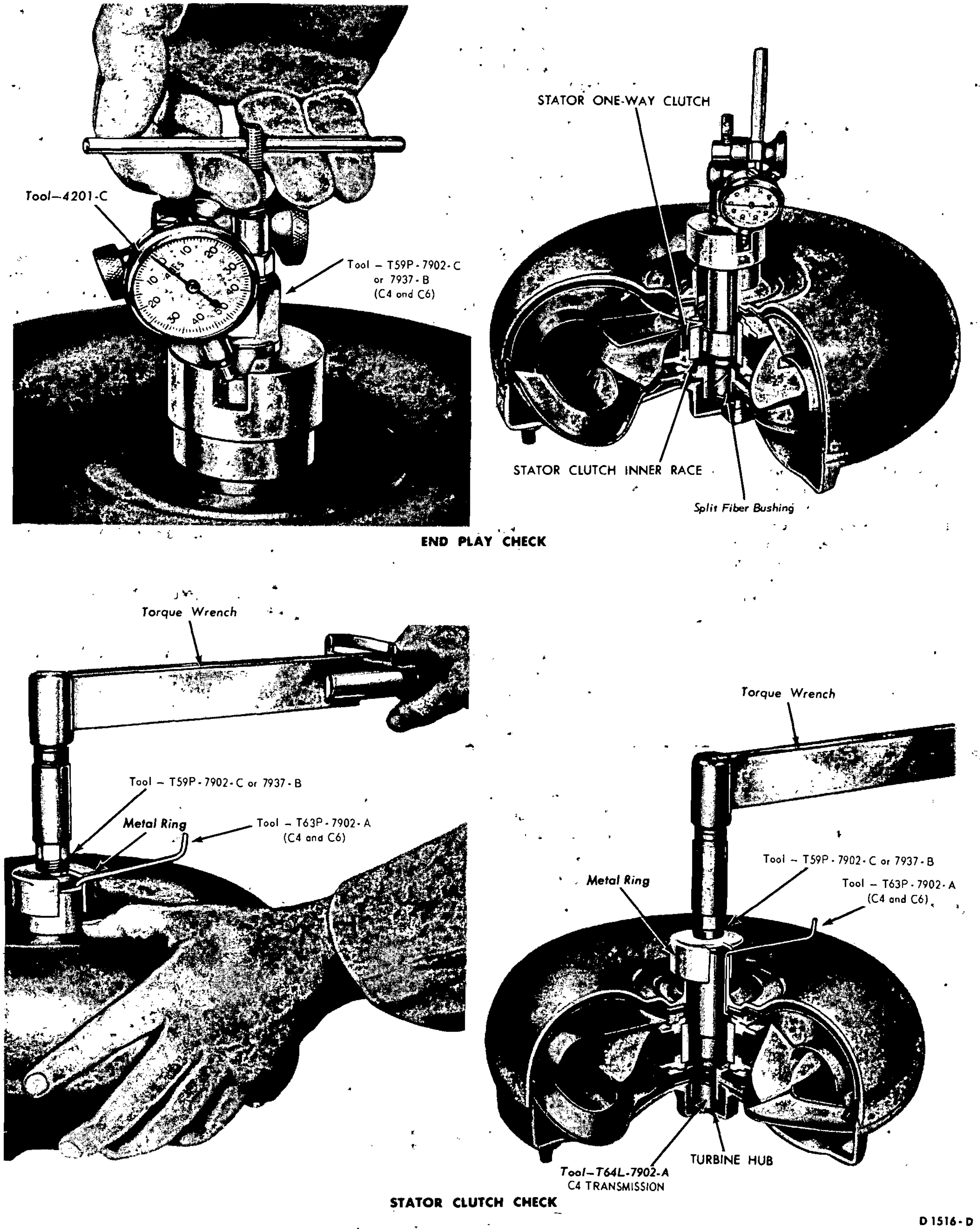


FIG. 14—Converter Tool Installation—Typical

8. Remove both drain plugs from the converter, then start the shaker and flushing pump motors and allow it to operate for seven minutes in this manner.
9. Shut off the flushing pump and allow the shaker to operate until the converter is nearly dry of cleaning fluid, then shut off the shaker motor.
10. Remove the converter from the mounting pad and place it on the screen and allow all cleaning fluid to drain from it.
11. Repeat steps 5 through 10 to complete the cleaning operation.
12. After all cleaning fluid has been drained, torque the drain plugs to specification.

INSPECTION

A special tool (Fig. 13) must be used to check the condition of the converter. This special tool is used to check the turbine and stator end play and the operation of the one-way stator clutch.

TURBINE AND STATOR END PLAY CHECK

1. Insert the tool into the converter pump drive hub until it bottoms.
2. Install the guide over the converter pump drive hub.
3. Expand the split fiber bushing in the turbine spline by tightening the adjusting nut. Tighten the adjusting nut until the tool is securely locked to the turbine spline.
4. Attach a dial indicator to the tool (Fig. 14). Position the indicator button on a converter pump drive hub, and set the dial face at 0 (zero).
5. Lift the tool upward as far as it will go and note the indicator reading. The indicator reading is the total end play which the turbine and stator share. If the total end play exceeds specifications, replace the converter.
6. Loosen the adjusting nut to free the split bushing, and then remove the tool from the converter.

STATOR ONE-WAY CLUTCH CHECK

1. Install the stator outer race holding tool in one of the holes provided in the stator.
2. Insert the tool in the converter pump drive hub.
3. As the tool enters the converter, the spline on the tool (Fig. 14) will engage the stator clutch inner race spline.
4. Place a torque wrench on the tool (Fig. 14). The tool (and stator inner race) should turn freely clockwise (from the pump drive hub side of the converter). It should lock up and hold a 10 ft-lb pull when the wrench is turned counterclockwise. Try the clutch for lockup and hold in at least five different locations around the converter. If the clutch fails to lock up and hold a 10 ft-lb torque, replace the converter unit.

The metal ring, which is a part of this tool, will have to be held by hand, to hold the lock pin during this check.

5. Remove the tools from the converter.

STATOR TO IMPELLER INTERFERENCE CHECK

1. Position a stator support shaft on the bench with the spline end of the stator shaft pointing up (Fig. 15).
2. Place the front pump rotor over the stator shaft with the flat side of the rotor down.
3. Place the converter over the stator support shaft so that the front pump flats are in normal (running) engagement with the pump rotor. The converter pump driving hub will bottom the rotor.
4. While holding the stator shaft stationary, try to rotate the converter counterclockwise. The converter should rotate freely without any signs of interference or scraping within the converter assembly.
5. If there is an indication of scraping, the trailing edges of the stator blades may be interfering with the leading edges of the impeller blades. In such cases, replace the converter.

STATOR TO TURBINE INTERFERENCE CHECK

1. Position the converter, front side down, on the bench.
2. Install the front pump assembly (complete) to engage the mating splines of the stator support and stator, and pump drive gear flats.
3. Install the input shaft, engaging the splines with the turbine hub (Fig. 16).
4. While holding the pump stationary, attempt to rotate the turbine with the input shaft. The turbine should rotate freely in both directions without any signs of interference or scraping noise.
5. If interference exists, the stator front thrust washer may be worn, allowing the stator to hit the turbine. In such cases, the converter must be replaced.

The converter crankshaft pilot should be checked for nicks or damaged surfaces that could cause interference when installing the converter into the crankshaft. Check the converter front pump drive hub for nicks or sharp edges that would damage the pump seal.

FRONT PUMP AND STATOR SUPPORT

1. Inspect the clutch drum journal for wear and roughness.
2. Check the side clearances between the clutch apply pressure seal rings and their grooves in the stator support. These clearances should be between 0.0035 and 0.0045 inch.
3. Remove the clutch apply rings and install them in their normal running position in the clutch drum. Then check the ring gaps. This ring gap clearance should be between 0.002 and 0.009 inch.
4. Inspect the input shaft bushings in the stator support shaft for wear.

Check the oil ring grooves in the stator support for nicks, burrs or

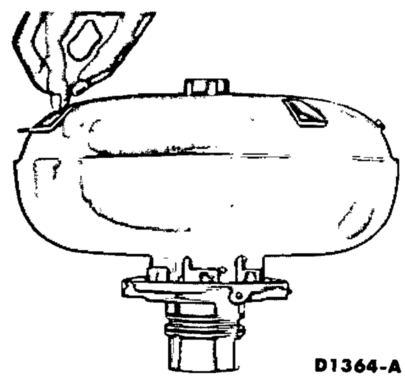


FIG. 15—Checking Stator to Impeller Interference

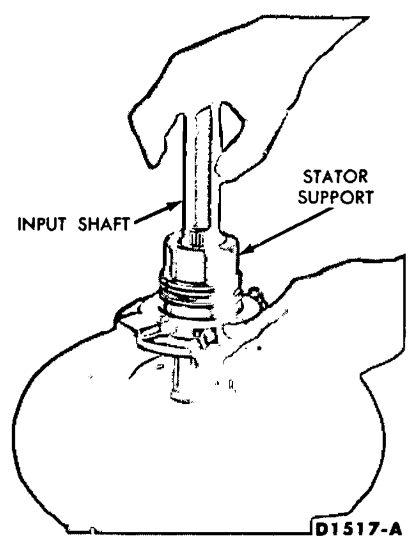


FIG. 16—Checking Stator to Turbine Interference

Trouble Symptom	Items to Check	
	Transmission in Vehicle	Transmission Out of Vehicle
Rough Initial Engagement in D or 2	K B W F E	
Rough Initial Engagement 2 Only	G J	
1-2 or 2-3 Shift Points Incorrect	A L B C D W E	
Rough 2-3 Shift	B F E	
Engine Overspeeds on 2-3 Shift	B G W E F	r
No Shift Points	B C D E J	
No 2-3 Shift	C R D E	b r
No 3-1 Shift in D	B E	
No Forced Downshifts	L W E	
Runaway Engine on Forced Downshift	G F E J B	c
Rough 3-2 or 3-1 Shift at Closed Throttle	K B E	
Shifts 1-3 in D	G J	
No Engine Braking In First Gear—Manual Low Range	H I	
Creeps Excessively in D	K	
Slips or Chatters in First Gear, D	A B W F E	a c i
Slips or Chatters in Second Gear	A B G W F E J	a c
Slips or Chatters in R	A H W F E I	b c
No Drive in D Only	C E	i
No Drive in 2 Only	C	
No Drive in R Only	C H I E R	b c
No Drive in D, 2, or 1	D W R	a
No Drive in Any Selector Lever Position	A C W F E R	c h
Lockup in 2 Only	H I	i
Lockup in R Only		a g
Parking Lock Binds or Does Not Hold	C	g
Transmission Overheats	A O F	n
Maximum Speed Too Low, Poor Acceleration		n
Transmission Noisy in N	F	d
Transmission Noisy in First, Second, and Reverse Gear	F	h d
Transmission Noisy in P	F	d
Fluid Leak	M N O P Q S U X	j m p

KEY TO DIAGNOSIS GUIDE

	TRANSMISSION IN VEHICLE
A	Fluid Level
B	Vacuum Diaphragm Unit or Tubes
C	Manual Linkage
D	Governor
E	Valve Body
F	Control Pressure Regulator Valve
G	Intermediate Band
H	Low-Reverse Band
I	Low-Reverse Servo
J	Intermediate Servo
K	Engine Idle Speed
L	Downshift Linkage
M	Convertor Drain Plugs
N	Oil Pan Gasket, or Filler Tube
O	Oil Cooler and Connections
P	Manual or Downshift Lever Shaft Seal
Q	1/8-inch Pipe Plug in Side of Case
R	Perform Air-Pressure Check
S	Extension Housing to Case Gaskets and Lockwashers
U	Extension Housing Rear Oil Seal
W	Perform Control Pressure Check
X	Speedometer Driven Gear Adapter Seal

	TRANSMISSION OUT OF VEHICLE
a	Forward Clutch
b	Reverse-High Clutch
c	Leakage in Hydraulic System
d	Front Pump
g	Parking Linkage
h	Planetary Assembly
i	Planetary One-Way Clutch
j	Engine Rear Oil Seal
m	Front Pump Oil Seal
n	Converter One-Way Clutch
p	Front Pump to Case Gasket or Seal
r	Reverse-High Clutch Piston Air Bleed Valve

FIG. 17—C4 Automatic Transmission Diagnosis Guide

Trouble Symptom	Items to Check	
	Transmission In Vehicle	Transmission Out of Vehicle
No Drive in D, 2 and 1	C W E R	a c
Rough Initial Engagement in D or 2	K B W E	a
1-2 or 2-3 Shift Points Incorrect or Erratic	A B L C D W E R	
Rough 1-2 Upshifts	B J G W E	
Rough 2-3 Shifts	B J W G E R	b r
Dragged Out 1-2 Shift	A B J W G E R	c
Engine Overspeeds on 2-3 Shift	C A B J W E G	b r
No 1-2 or 2-3 Shift	C L B D W E G J	b c
No 3-1 Shift in D	D E	
No Forced Downshifts	L W E	
Runaway Engine on Forced 3-2 Downshift	W J G E B	c
Rough 3-2 or 3-1 Shift at Closed Throttle	K B J W E	
Shifts 1-3 in D	G J E D R	
No Engine Braking in First Gear–Manual Lo Range	C H E D R	c
Creeps Excessively	K	
Slips or Chatters in First Gear, D	A B W E	a c i
Slips or Chatters in Second Gear	A B J G W E R	a c
Slips or Chatters in R	A B C H W E R	b c r
No Drive in D Only	C W E	i
No Drive in 2 Only	A C W J E R	c
No Drive in 1 Only	A W E R	c
No Drive in R Only	A C H W E R	b c r
No Drive in Any Selector Lever Position	A C W E R	c d
Lockup in D Only	E	g c
Lockup in 2 Only	H E	b g c i
Lockup in 1 Only	E	g c
Lockup in R Only	E	a g c
Parking Lock Binds or Does Not Hold	C	g
Transmission Overheats	O E B W	n s
Maximum Speed Too Low, Poor Acceleration	Y Z	n
Transmission Noisy in N and P	A E	d
Transmission Noisy in First, Second, Third or Reverse Gear	A E	h a d i
Fluid Leak	A M N O P Q S U X B J	i m p
Car Moves Forward in N	C	a

PROBABLE TROUBLE SOURCES

A Fluid Level	W Perform Control Pressure Check
B Vacuum Diaphragm Unit or Tubes Restricted–Leaking–Adjustment	X Speedometer Driven Gear Adapter Seal
C Manual Linkage	Y Engine Performance
D Governor	Z Car Brakes
E Valve Body	a Forward Clutch
G Intermediate Band	b Reverse-High Clutch
H Low-Reverse Clutch	c Leakage in Hydraulic System
J Intermediate Servo	d Front Pump
K Engine Idle Speed	g Parking Linkage
L Downshift Linkage–Including Inner Lever Position	h Planetary Assembly
M Converter Drain Plugs	i Planetary One-Way Clutch
N Oil Pan Gasket, Filler Tube or Seal	j Engine Rear Oil Seal
O Oil Cooler and Connections	m Front Pump Oil Seal
P Manual or Downshift Lever Shaft Seal	n Converter One-Way Clutch
Q 1/8 Inch Pipe Plugs in Case	p Front Pump to Case Gasket or Seal
R Perform Air Pressure Check	r Reverse-High Clutch Piston Air Bleed Valve
S Extension Housing to Case Gasket	s Converter Pressure Check Valves
U Extension Housing Rear Oil Seal	

FIG. 18—C6 Automatic Transmission Diagnosis Guide

damaged edges. Check the gasket mating surface of the pump body for damaged surface.

5. Inspect the converter pump drive hub bushing in the front pump housing. Inspect the pump seal in the pump housing for defects that would cause fluid leakage.

GOVERNOR

1. Inspect the governor valves and housing for wear. **Crocus cloth may be used to polish the valves if care is taken to avoid rounding the sharp edges.**

2. Install the governor valves in the governor housing and check them for free movement. Each valve should fall of its own weight when dry.

3. When cleaning the governor assembly, the oil screen should be removed from the distributor body and thoroughly blown out with compressed air.

FORWARD CLUTCH ASSEMBLY

1. Inspect the composition clutch plates for damage. These plates should be flat. If the plates are not flat, they must be replaced. If the old plates are to be re-used, they must **not** be cleaned in a vapor degreaser or cleaned with any type of detergent solution. Wipe them clean with lint-free towels.

If new composition plates are to be installed, soak them in automatic transmission fluid for at least 15 minutes before assembling them in the clutch drum. This soaking prevents damage to the plates during the transmission fluid fill period and initial running-in.

2. Inspect the steel clutch plates. These clutch plates should also be flat. If they are not flat, they should be replaced.

3. Inspect the clutch release springs for being broken or distorted.

4. Inspect the clutch piston ball check valve for free movement and proper seating. Make sure the orifice in the clutch piston is open.

5. Inspect the clutch drum bushing for wear.

REVERSE—HIGH CLUTCH

1. Inspect the drum band surface, the bushings, and thrust surfaces for scores. Minor scores may be removed with crocus cloth. **Badly scored parts must be replaced.**

Inspect the clutch piston bore and the piston inner and outer bearing surfaces for scores. Check the air bleed ball valve in the clutch piston for free movement and proper seating. Check the hole to make sure it is not plugged.

2. Check the fluid passages for obstructions. All fluid passages must be clean and free of obstructions.

3. Inspect the clutch plates for wear and scoring and check the plates for fit on the clutch hub serrations. Replace all plates that are badly scored, worn or do not fit freely in the hub serrations.

4. Inspect the clutch pressure plate for scores on the clutch plate bearing surface. Check the clutch release springs for distortion.

CONTROL VALVE BODY

1. Inspect all valve and plug bores for scores. Check all fluid passages for obstruction. Inspect the check valves for free movement. Inspect all mating surfaces for burrs or distortion. Inspect all plugs and valves for burrs and scores. **Crocus cloth can be used to polish valves and plugs if care is taken to avoid rounding the sharp edges of the valves and plugs.**

2. Inspect all springs for distortion. Check all valves and plugs for free movement in their respective bores. Valves and plugs, when dry, must fall from their own weight in their respective bores.

PINION CARRIERS

1. The pins and shafts in the planet assemblies should be checked for loose fit and/or complete disengagement. Replacement, using a new planet assembly, should be made if either condition is found to exist.

2. Inspect the pinion gears for damaged or excessively worn areas.

3. Check for free rotation of the pinion gears.

4. Inspect the C4 transmission front planet thrust surface for excessive wear.

SERVO-ASSEMBLIES

1. Inspect the servo piston and seals for defects that would cause hydraulic leakage.

2. Inspect the cover seal and gasket cover sealing surface for defects.

CASE

1. Inspect the case for cracks.

2. With an air hose, check all fluid passages for obstruction or cross leakage.

3. Check all case linkage parts for free travel and proper engagement.

4. Check the vent passage for obstructions with an air hose.

ONE-WAY CLUTCH

1. Inspect the outer and inner races for scores or damaged surface area where the rollers contact the races.

2. Inspect the rollers and springs for excessive wear or damage.

3. Inspect the spring and roller cage for bent or damaged spring retainers.

PART 7-2—C4 Automatic Transmission

1 DESCRIPTION AND OPERATION

DESCRIPTION

Figure 1 shows the location of the converter, front pump, clutches, gear train and most of the internal parts used in the C4 transmission.

The identification tag (Fig. 2) is located under the lower front intermediate servo cover bolt. The tag shows the model prefix and suffix, engine displacement, and the built date code. The service identification number indicates changes to service details which affect interchangeability **when the transmission model is not changed.** For interpretation of this number, see the Master Parts Catalog.

Figure 3 shows the engine and transmission model applications.

OPERATION

TORQUE CONVERTER

The hydraulic torque converter (Fig. 4) consists of an impeller (pump), a turbine, and a stator. All these parts are enclosed and operate in a fluid-filled housing.

When the engine is running, the fluid in the torque converter flows from the impeller to the turbine and back to the impeller through the stator. This flow produces a maximum torque increase of about 2 to 1 when the turbine is stalled. When enough torque is developed by the impeller, the turbine begins to rotate, turning the turbine shaft (input shaft).

The converter torque multiplica-

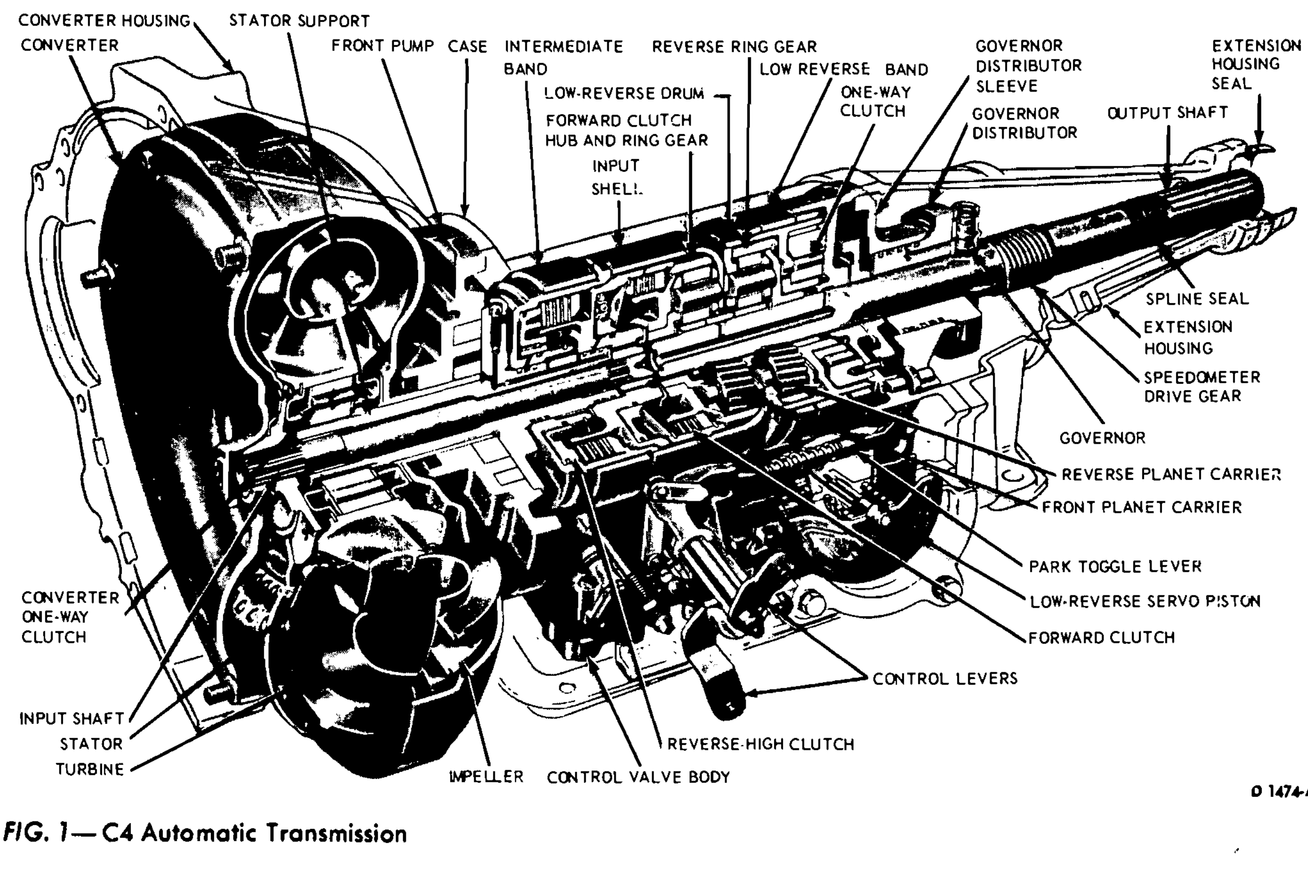


FIG. 1—C4 Automatic Transmission

tion gradually tapers off as turbine speed approaches impeller speed, and it becomes 1 to 1 when the turbine is being driven at 9/10 impeller speed. This is known as the coupling point.

When the turbine is rotating at less than 9/10 impeller speed, the converter is multiplying torque. The fluid leaving the turbine blades strikes the front face of the stator blades. These blades are held stationary by the action of a one-way clutch (Fig. 4) as long as the fluid is directed against the front face of the blades.

When the turbine rotates faster than 9/10 impeller speed the converter no longer multiplies torque. The fluid is directed against the back face of the stator blades. As the one-way clutch permits the stator to rotate only in the direction of impeller rotation, the stator begins to turn with the impeller and turbine. The converter operates as an efficient fluid coupling as long as the turbine speed remains greater than 9/10 impeller speed.

A constant flow of fluid into and out of the converter is maintained. The fluid coming out of the converter is forced through a cooler located in the radiator tank.

PLANETARY GEAR TRAIN, CLUTCHES, BANDS, AND SERVOS

Planetary Gear Train

The gear train consists of an input shaft that is splined to the turbine of the converter and the forward clutch cylinder (Fig. 5). The forward clutch cylinder rotates the steel internal clutch plates of the forward clutch and the composition clutch plates of the reverse-high clutch. When the reverse-high clutch is applied, the external area of the clutch hub is splined to and drives the input shell to rotate the sun gear. When the forward clutch is applied, the composition clutch plates drive the forward clutch hub and ring gear. The ring gear rotates the forward planet gears.

When applied, the intermediate band holds the reverse-high clutch drum, input shell and sun gear from rotating.

The sun gear, which is driven by the input shell, is meshed with the forward and reverse planet gears. The reverse planet carrier and low reverse drum are locked together with external splines. The low-reverse drum can be held from rotating by the low-reverse band. In D the low-reverse drum is also held from

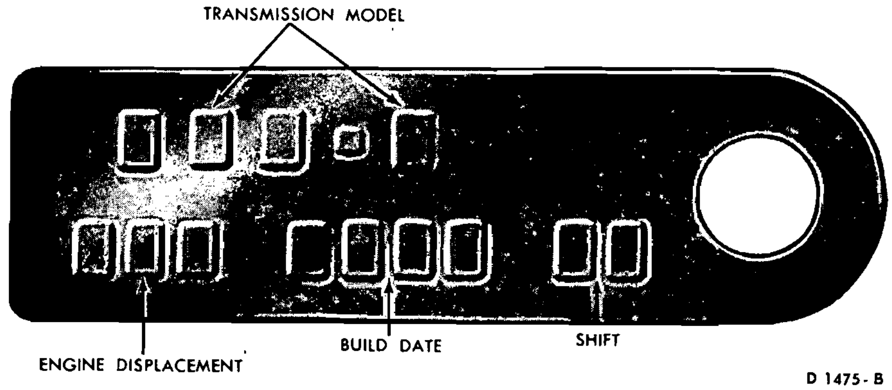


FIG. 2—Identification Tag

Car Model	Transmission Model	Engine Model
Falcon (Column Shift)	PEB-A	170-1V
Mustang (Floor Shift)	PEB-B	200-1V
Falcon (Column Shift)	PEB-C	200-1V
Fairlane (Floor Shift)	PEB-E	200-1V
Comet-Fairlane (Column Shift)	PEB-F	200-1V
Falcon (Column Shift)	PEG-H	289-2V-4V
Mustang-Cougar (Floor Shift)	PEE-C	289-2V-4V
Comet-Fairlane (Floor Shift)	PEE-B	289-2V
Fairlane—Police & Taxi	PEE-D	200-1V
(Column Shift)	PEE-E	289-2V
Comet-Fairlane (Column Shift)	PEE-J	289-2V
Mustang	PEE-K	289-4V HP

FIG. 3—Engine and Transmission Application

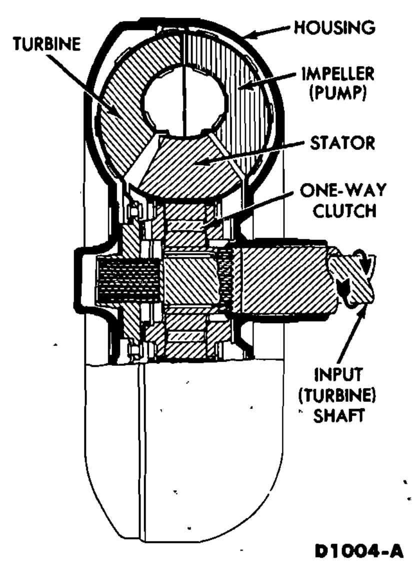


FIG. 4—Sectional View of Torque Converter—Typical

rotating by a roller type oneway clutch.

The forward planet carrier, reverse ring gear hub, park gear and governor oil collector are all splined to the output shaft.

Forward Clutch

The input shaft is splined to and drives the forward clutch cylinder (Fig. 5). Rotation of the cylinder drives the steel clutch plates in the forward clutch and the composition clutch plates of the reverse-high clutch.

When the forward clutch piston is applied by hydraulic pressure, the movement of the piston against the disc spring locks the steel and composition clutch plates together to drive the forward clutch hub and ring gear.

When hydraulic pressure is released from the piston, the disc spring moves the piston to the released position. As the disc spring moves, the steel and composition clutch plates are released. This stops the rotation of the forward clutch hub and ring gear (Fig. 5). The forward clutch is applied in all forward drive gear ratios.

Reverse-High Clutch

When hydraulic pressure is direct-

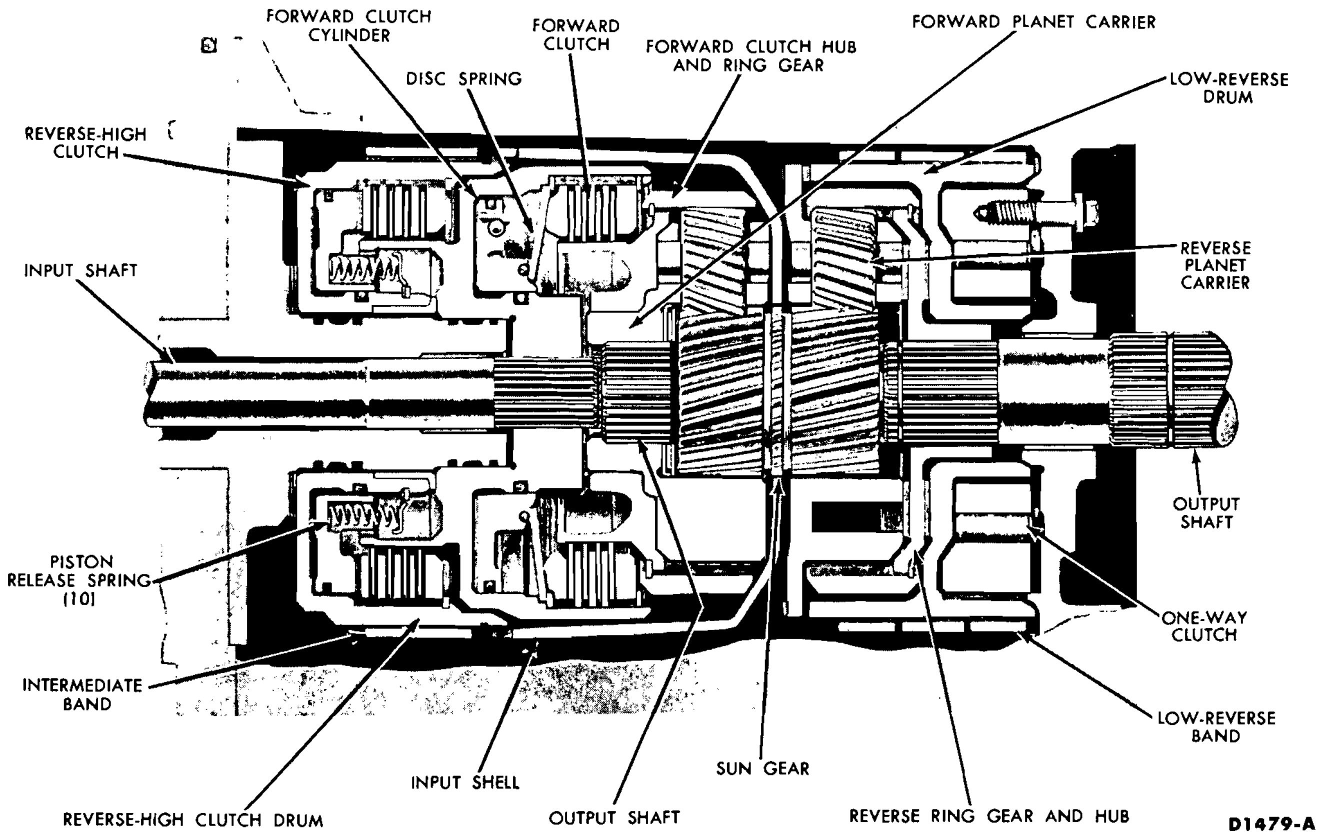


FIG. 5—Gear Train, Clutches and Bands

ed to the clutch piston, the piston moves against the release springs (Fig. 5). The piston movement locks the steel and rotating composition clutch plates together. The steel clutch plates drive the reverse-high clutch drum which is splined to the input shell. Rotation of the input shell drives the sun gear which is splined to the input shell.

To release the reverse-high clutch, hydraulic pressure is exhausted from the apply side of the piston. The return springs move the piston to the released position. The steel and composition clutch plates are now released to stop rotation of the reverse-high clutch drum, input shell and sun gear.

Intermediate Servo and Band

The intermediate servo is machined into the transmission case and the band has an **external** adjustment screw (Fig. 6). To apply the servo, hydraulic pressure is directed from the control valve body, through a hole in the case to the hole in the servo piston stem. The pressure passes through the center of the piston stem and then to the apply side of the piston. The piston moves against the return spring to tighten the intermediate band around the reverse-high clutch drum.

To release the servo piston, hydraulic pressure is directed to the release side of the piston. The release pressure is assisted by the compressed return spring to move the servo piston and intermediate band to the OFF position. The intermediate servo and band are applied only during the intermediate gear operation.

Low-Reverse Servo and Band

The low-reverse servo is machined into the transmission case and the band has an **external** adjustment screw (Fig. 7). To apply the servo, hydraulic pressure is directed from the control valve body through a hole in the case to a hole in the piston stem. The pressure then passes through the center of the piston stem to the apply area of the servo piston. The apply pressure force moves the piston against the piston return spring to tighten the low-reverse band around the low-reverse drum.

To release the servo piston and band, the hydraulic pressure is exhausted from the apply side of the piston. The compressed return spring expands to release the piston and the low-reverse band.

POWER FLOW

All Gear Rotations are viewed from the front of transmission. Figure 8 shows the gear ratios obtained in the different selector lever positions.

Power Flow Neutral

In neutral (Fig. 9) the clutches or bands are not applied, therefore, no power is transmitted to the output shaft.

Power Flow First Gear

In low gear (Fig. 9), the forward clutch is applied, and the planet one-way clutch or low-reverse band is holding the low-reverse drum and reverse planet carrier from rotating. The power flow is through the input shaft and into the forward clutch. The input shaft is splined to and drives the forward clutch cylinder. Rotation of the forward clutch drives the forward clutch hub and ring gear. The ring gear rotates the forward planet gears clockwise to cause the sun gear to rotate counterclockwise.

Counterclockwise rotation of the sun gear turns the reverse planet gear clockwise. The reverse planet carrier being splined to the low-reverse drum is held from rotating by the one-way clutch or low-reverse band.

With the reverse planet carrier

held stationary, the clockwise rotation of the reverse planet gears rotates the reverse ring gear and hub clockwise. The hub of the reverse ring gear is splined to the output shaft and rotates the output shaft clockwise.

The output shaft rotation is at a reduced speed, compared to the input shaft rotation, but at an increased torque.

The output shaft rotation at a reduced speed is caused by the fact that the forward planet carrier rotates at the same speed of the output shaft and in the same direction since the carrier is splined to the output shaft. The forward ring gear and planet assembly are rotating in the same direction, but the planet carrier is rotating at a slower speed than the ring gear. Therefore, the low gear ratio (torque multiplication) is a combination of the ratios provided by the forward and reverse planet assemblies.

Power Flow Intermediate Gear

In intermediate gear (Fig. 9), the forward clutch is applied and the intermediate band is holding the reverse high clutch drum, input shell and sun gear from turning.

The power flow is through the input shaft into the forward clutch and forward front planet assembly ring gear. The sun gear is held from rotating by the intermediate band. This causes the forward planet pinions to rotate (walk) around the sun gear, carrying the forward planet carrier with them. The forward planet carrier, being splined to the output shaft, causes clockwise rotation of the output shaft at a reduction in speed compared to the speed of the input shaft, and at an increase in torque.

Clockwise rotation of the output shaft causes clockwise rotation of the output shaft ring gear, causing the reverse planet pinions to also rotate (walk) around the sun gear in a clockwise direction. The reverse planet carrier will also rotate clockwise and the one-way clutch inner race being splined to the reverse planet carrier, will overrun.

Power Flow High Gear

In high gear (Fig. 9), the forward and reverse-high clutches are applied. The power flow is through the input shaft into the forward clutch cylinder. (The forward clutch cylinder rotates the steel clutch plates of the forward clutch and the composition clutch plates of the reverse-high

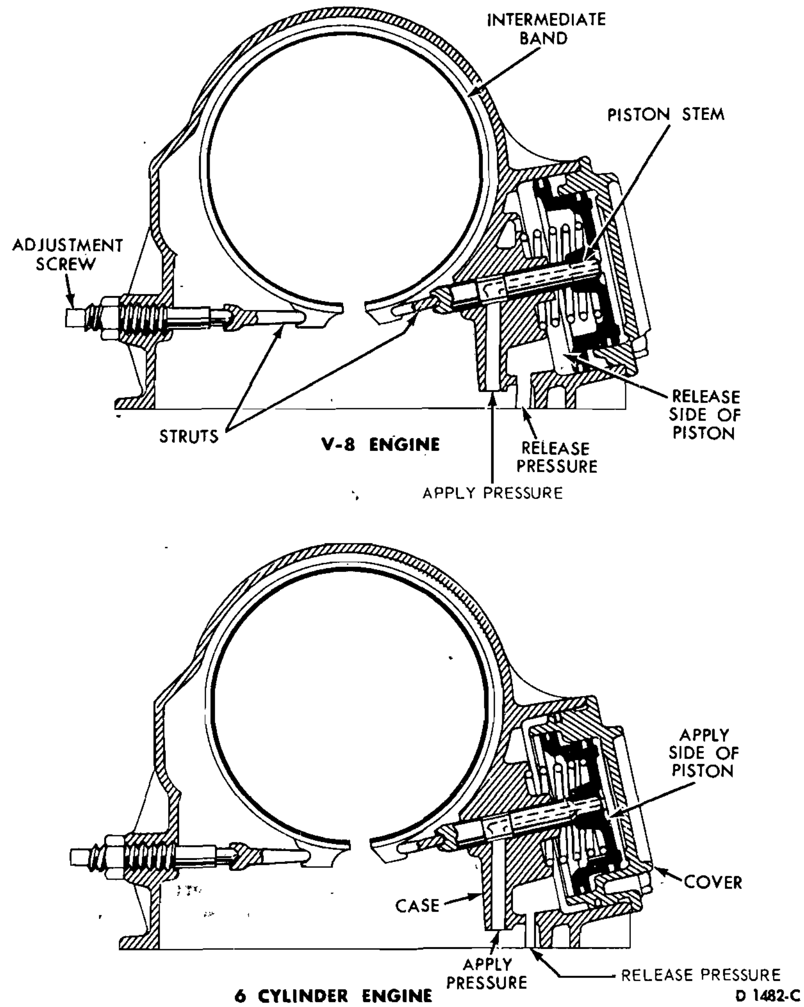


FIG. 6—Intermediate Servo and Band

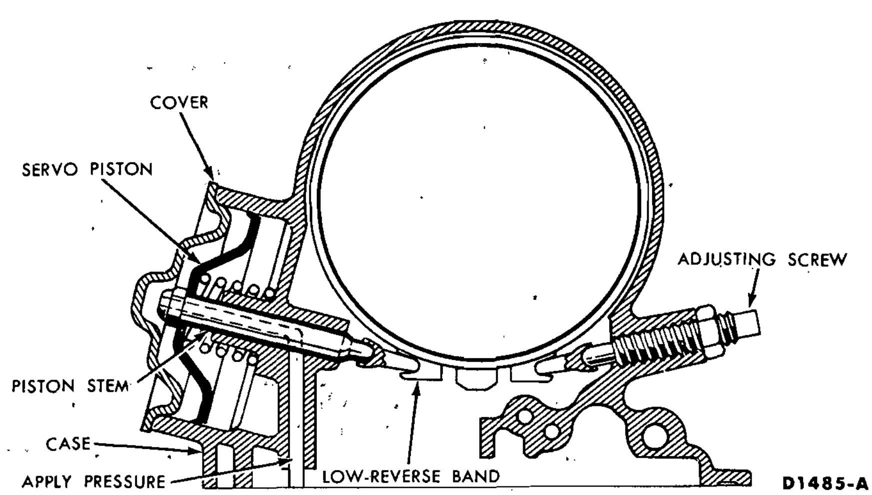


FIG. 7—Low-Reverse Servo and Band

clutch). The forward clutch directs the power flow through the forward clutch hub and ring gear to the forward planet carrier.

The reverse-high clutch directs the power flow through the input shell to the sun gear. With the sun gear and the forward clutch hub

Transmission Selector Position	Gear	Gear Ratios	Forward Clutch	Reverse High Clutch	Intermediate Band	Low Reverse Band	One-Way Clutch
N or P	Neutral	–	Off	Off	Off	Off	Off
1	Low	2.46:1	On	Off	Off	On	Holding
D	Low	2.46:1	On	Off	Off	Off	Holding
D or 2	Intermediate	1.46:1	On	Off	On	Off	Over-Running
D	High	1.00:1	On	On	Off	Off	Over-Running
R	Reverse	2.20:1	Off	On	Off	On	Not Affected

FIG. 8—Gear Ratios

ring gear driven at the same speed the forward planet assembly (that is splined to the output shaft) is forced to rotate the output shaft at the same speed and direction to provide high gear.

Power Flow Reverse

In reverse (Fig. 9), the reverse-high clutch and low-reverse band are applied. The power flow is through the input shaft, reverse-high clutch, input shell and to the sun gear. Clockwise rotation of the sun gear causes counterclockwise rotation of the reverse planet gears.

The low-reverse band, holding the low-reverse drum and reverse planet carrier from turning, causes the reverse planet gears to rotate counterclockwise.

This rotates the reverse ring gear and hub counterclockwise. The hub splined to the output shaft rotates the output shaft counterclockwise at a reduction in speed and at an increase in torque for reverse gear.

HYDRAULIC CONTROL SYSTEM

The hydraulic system described below (Fig. 10) includes all models.

Front Pump

A gear type pump mounted on the front of the transmission case supplies the fluid for the operation of the hydraulic control system. Pump intake is through a screen which is part of the main control assembly and into the case casting and pump. Discharge is through the case into the main control assembly. Fluid from the front pump is directed to the following valves in the main control assembly:

Main Oil Pressure Regulator Valve
Manual Valve
Throttle Booster Valve
2-3 Shift Valve

Fluid is also directed to the primary throttle valve, which is located in the rear of the case, and the governor secondary valve which is located in the governor assembly, on the output shaft. Fluid pressure delivered to these valves is at a pressure controlled by the main oil pressure regulator valve.

Main Oil Pressure Regulator Valve

The main regulator valve assembly consists of the main oil pressure regulator valve and spring, main oil pressure booster valve, spring and sleeve, located in one bore in the main control assembly (Fig. 10).

Fluid is delivered to three valleys of the main regulator valve, from the front pump. The difference in diameter between the end land and the second land provides an area differential for regulation. Fluid pressure in this area tends to move the valve against spring force. Spring force is such that at approximately 60 psi front pump pressure, the main valve will move so that the third land uncovers the converter feed port, allowing additional pump volume to be used to charge the converter. If volume supplied by the front pump is greater than that required to maintain 60 psi line pressure, and converter and lube requirements, the valve will move further allowing the fourth land to uncover the port which allows excess pump volume to be discharged into the sump. Pressures over 60 psi which are required under various operating conditions are obtained by delivering fluid under pressure to the pressure booster valve, where it will cause the pressure booster valve to assist the main regulator valve spring in increasing regulated line pressure.

Source of these pressures which cause variations in control pressure are discussed later.

Manual Valve

One passage delivers line pressure to the manual valve. The valve is positioned by the manual linkage, according to the mode of operation desired, to direct fluid out of one or more of the line passages which lead from the manual valve. The four (4) passages leading from the manual valve (from left to right) are shown in Fig. 10.

1. 2
2. D
3. 1-R
4. R

The 2 passage is charged in the 2 range only.

The D passage is charged in all forward ranges.

The 1-R passage is charged in 1 and reverse ranges.

The R passage is charged in reverse range only.

In Neutral and Park the manual valve blocks the line pressure passage and exhausts the four passages leading from the manual valve.

The D passage supplies fluid to the D2 valve and the forward clutch.

The 2 passage supplies fluid to the adjoining ends of the 1-2 shift valve and D2 valve, and through one ball shuttle valve to the line coasting boost valve, manual low valve, 2-3 shift valve and downshift valve, through the downshift valve to and through the throttle modulator valve bore to the 1-2 shift valve.

The 1-R passage supplies fluid through a ball shuttle valve to the line coasting boost valve, manual low valve, 2-3 shift valve, downshift valve, and through the downshift valve to and through the throttle modulator valve bore to the 1-2 shift valve. In addition, fluid is supplied to and through the D2 valve when it is in the closed (up) position, to the low and reverse servo, applying the low and reverse band. The same fluid is also directed to the spring end of the D2 valve.

The R passage directs fluid to the middle valley of the pressure booster valve, to and through the 2-3 shift valve to the reverse-direct clutch, applying it, and to the release side of the intermediate servo (through intermediate servo check valve). Fluid

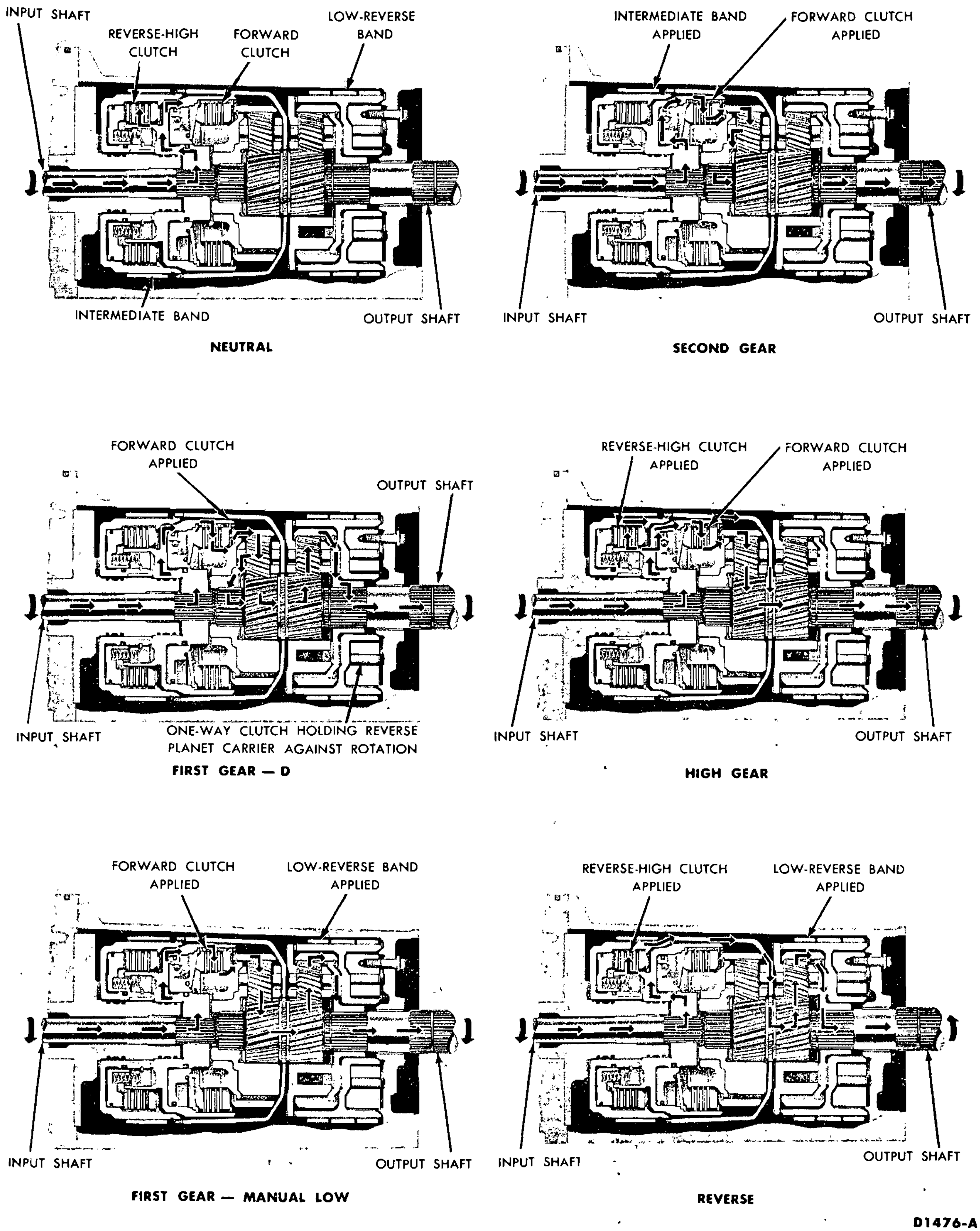


FIG. 9—Power Flow

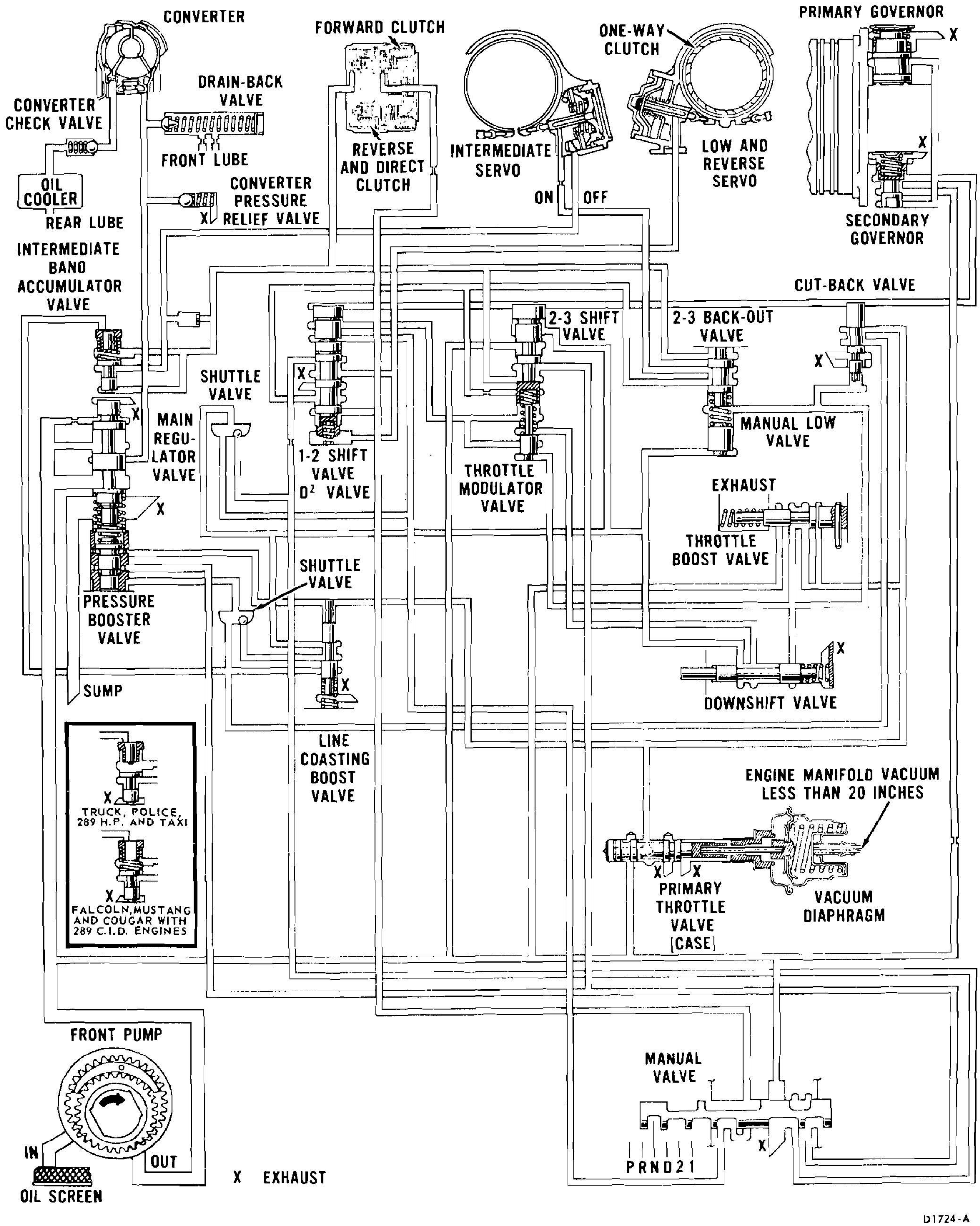


FIG. 10—Hydraulic Control System

is also directed to the upper end of the 2-3 backout valve.

Primary Throttle Valve

The primary throttle valve responds to manifold vacuum changes. Primary throttle pressure starts at 20 inches (nominal) of mercury vacuum. Primary throttle pressure is delivered to the:

1. Cutback valve.
2. Top of intermediate band accumulator valve (through cutback valve).
3. Second land of coasting boost valve (through cutback valve).
4. Upper valley of pressure booster valve through top of line coasting boost valve.
5. End of and through the throttle booster valve.
6. End of pressure booster valve (through ball shuttle valve).

Figure 11 shows how primary throttle pressure varies with engine vacuum.

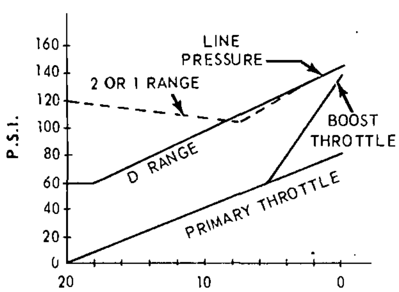


FIG. 11—Primary Throttle Pressure, Boost Throttle Pressure and Line Pressure Versus Manifold Vacuum

Pressure Booster Valve

(D, 2, 1 Range). T.V. pressure is delivered to the upper valley of the pressure booster valve and to the end of the pressure booster valve through a ball shuttle valve. Depending on mode of operation, coasting boost pressure instead of T.V. pressure may be directed from the line coasting boost valve through a ball shuttle valve to the end of the pressure booster valve. When force created on the booster valve by T.V. pressure or T.V. and coasting boost pressure exceeds pressure booster valve spring force, the force will be added to the main regulator valve spring force transmitted to the regulator valve. This will provide increased line pressures required to compensate for increased throttle openings and engine torque output. Figure 11 shows how line pressure varies with engine vacuum at 0 output shaft rpm.

(R Range). In reverse, additional fluid pressure is required to prevent clutch and/or band slippage under stall or partial stall conditions. This additional pressure is provided by directing R oil pressure to the middle valley of the pressure booster valve. The differential in area between the lands creates a force which is added to the forces present due to T.V. pressure and the line coasting boost valve pressure. The resultant force is added to the force of the main regulator valve spring, to boost line pressure to a higher value than is available in the forward driving ranges.

Governor

At Rest—0 mph. Control pressure (line) is fed to the secondary governor valve through the center passage in the valve body. Because of the differential in area of the inner and outer lands of the valve, the valve will be forced inward, shutting off line pressure feed to the governor passage and allowing this passage to be opened to exhaust, at the inner end of the valve. At the same time, line pressure will pass by two flats on the outer end of the valve, pressurizing the line leakage passage leading to the primary governor valve. At rest, the spring on the outer end of the primary governor valve holds the primary governor valve inward, blocking further flow of the fluid in the line leakage passage. This causes pressure in the line leakage passage to build to the same value as line pressure. As a consequence, the secondary governor valve is held in and there is no pressure in the governor circuit.

Above 10 mph. When vehicle speed reaches approximately 10 mph, centrifugal force on the primary governor valve overcomes spring force, and the valve moves outward, opening the line leakage passage to exhaust. This action reduces the pressure on the end of the secondary governor valve to zero (0), allowing the secondary valve to also move outward, due to spring force and centrifugal force. When the secondary valve moves outward, it closes the governor exhaust passage, and allows line pressure to enter the governor passage. As pressure builds in the governor passage it will create a force on the secondary governor valve due to the differential in areas of the inner and outer lands of the valve. This force tends to move the valve inward. When the force on the valve created by pressure in the governor passage exceeds the centrifugal force plus spring force, the valve will move inward, allowing governor pressure to exhaust, and close the passage between line pressure and governor pressure. When governor pressure is reduced, the secondary valve will again move outward, closing the governor exhaust port and opening the line pressure to governor passage. Above 10 mph, governor pressure is regulated in this manner, and will vary with vehicle speeds.

If vehicle speed drops below 10 mph, the primary valve spring will move the primary governor valve in, closing the line leakage exhaust port at the primary valve. Pressure in the line leakage passage will become equal to line pressure, forcing the secondary governor valve in. This action shuts off line pressure feed to the governor passage and exhausts the governor circuit.

When the secondary governor valve is regulating, governor pressure will be delivered to the cut-back valve, end of the 2-3 shift valve and the 1-2 shift valve. Figure 12 shows the relationship between governor pressure and output shaft rpm.

Throttle Booster Valve

Throttle plate openings above 50° provide very little change in engine vacuum as compared to throttle plate openings below 50°. The throttle booster valve is provided to boost throttle pressure and provide the necessary shift delay for engine throttle plate openings above 50°.

Below approximately 60 psi primary T.V. pressure, T.V. pressure flows to and through the throttle boost valve unaffected, working on the end of the boost valve and on the area differential on the spring side of the boost valve. As a consequence, T.V. pressure passes through the throttle boost valve unaffected.

When T.V. pressure increases above 60 psi, the force created by T.V. pressure acting on the end of the throttle boost valve, minus the force of T.V. pressure acting on the area differential on the spring side, will exceed the force of the spring. This causes the valve to move against the spring, closing off primary T.V. pressure to the area differential on the spring side and permitting this area to be fed from line pressure, causing a boost in the pressure used for shift delay only. Because the area

of the end of the throttle boost valve exceeds the area differential on the spring side by approximately 2 1/2 to 1, throttle boost pressure above 60 psi primary T.V. pressure will increase 2.5 psi, per 1 psi primary T.V.

T.V. pressure from the throttle booster valve is delivered to the downshift valve, throttle modulator valve, cut-back valve, and spring end of the 2-3 backout valve and manual low valve. Figure 11 shows the relationship between primary T.V. pressure and boosted throttle pressure.

Throttle Modulator Valve

The throttle modulator valve, located in the end of the 2-3 shift valve bore, reduces throttle pressure which acts on the ends of the 2-3 shift valve and on the area differential of the 1-2 shift valve. Modulated throttle pressure in these areas provides shift delay in relation to throttle opening.

Cut Back Valve

Increased line pressure is required to prevent clutch and band slippage under stall conditions. As vehicle speed increases, the requirements for increased line pressure are considerably reduced. The cut back valve provides for the reduction in line pressure. When governor pressure acting on the end of the cut back valve exceeds the force of T.V. pressure on its area opposing governor and throttle boost pressure, the cut back valve will move, cutting off primary T.V. pressure being fed to the pressure booster valve and intermediate band accumulator valve. The cut back valve movement will therefore vary with engine throttle opening and vehicle speed. See Figure 13 for line pressure variation with output shaft rpm (vehicle speed) at constant vacuum values.

Line Coasting Boost Valve

The line coasting boost valve is provided to boost line pressure under light throttle or closed throttle driving conditions in 2, 1 or R ranges. The boosted line pressure controls the 2-1 downshift point in 1 range.

Primary T.V. pressure is delivered to the end of the line coasting boost valve and to the upper valley of the pressure booster valve. 1-R or 2 oil pressure is directed from the manual valve through a ball shuttle valve to the line coasting boost valve. Under throttle off conditions, the force created by 1-R or 2 oil acting on the area differential will be directed

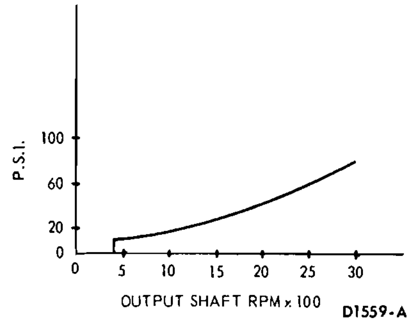


FIG. 12—Governor Pressure Versus Output Shaft RPM

through a ball shuttle valve to the end of the pressure booster valve.

The output of the coasting boost valve **decreases** with an **increase** in primary T.V. pressure. Primary T.V. pressure acting on the pressure booster valve tends to increase line pressure, however coasting boost pressure is decreasing, resulting in a slight reduction in regulated line pressure from 20 to 8 inches manifold vacuum at Zero or low vehicle speeds. Below 8 inches manifold vacuum, the output pressure of the coasting boost valve will connect to primary T.V. pressure from the cutback valve, which will increase regulated line pressure. At high road speeds (after cutback) the output of the coasting boost valve will decrease from 20" through 0 inches manifold vacuum which slightly decreases regulated line pressure.

Downshift Valve

(In 1, R and 2 Ranges). 1-R or 2 oil pressure is delivered to the downshift valve. The difference in diameter between the lands provides an area differential for regulation. This pressure will be referred to later as regulated downshift valve oil pressure and is used primarily to control the 2-1 downshift point in 1 range. Operation in D range, and under thru-detent throttle conditions in all ranges is unchanged.

1-2 Shift Valve Train and 2-3 Shift Valve

The 1-2 shift valve train is composed of the 1-2 shift valve, D2 valve, and the 1-2 shift valve spring.

Operation of the 1-2 shift valve train, 2-3 shift valve, and the downshift valve in the various modes is as follows:

(D Range: 1-2 Upshifts and 2-1 Downshifts). In D range the 1-2 shift valve is held closed (up) by modulated throttle pressure acting on the differential area between the two lands of

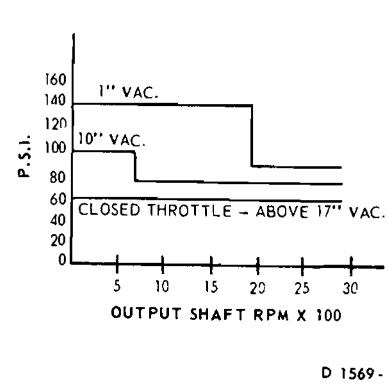


FIG. 13—Line Pressure Versus Output Shaft RPM

the 1-2 shift valve, by D oil pressure acting on the differential in area between the two lands at the spring end of the D2 valve, and by the 1-2 shift valve spring. Governor pressure tends to move the 1-2 shift valve train against these forces. When force created by governor pressure exceeds the forces holding the 1-2 shift valve train closed, the 1-2 shift valve and D2 valve will be opened (moved downward), closing the exhaust port and allowing D oil to pass through the D2 valve to accomplish the 1-2 shift. When the D2 valve is moved downward D oil is exhausted from the differential in areas provided by the lower two lands of the D2 valve. This action eliminates the force created by D oil which tends to hold the 1-2 shift valve train closed.

If governor pressure is reduced to the point where spring force and modulated throttle pressure force exceeds governor pressure force, the 1-2 shift valve train will move up (close) cutting off the flow of D oil through the valve and opening the exhaust port allowing a downshift to low gear.

If the throttle is open to the point where modulated throttle pressure acting on the 1-2 shift valve plus the 1-2 shift valve spring force creates a force greater than that provided by governor pressure, the 1-2 shift valve train will be closed, providing a torque demand downshift to low.

If the throttle is open through detent, the downshift valve moves to allow boosted throttle pressure to enter the modulated throttle pressure passage at the 1-2 shift valve to provide a forced 2-1 downshift.

(D Range: 2-3 Upshifts and 3-2 Downshifts). The 2-3 shift valve is held closed (up) by throttle modulator valve spring force, modulated throttle pressure force, and by line pressure force acting on the differential in area of the lands of the valve to which it is delivered.

Governor pressure tends to open the 2-3 shift valve. When force created by governor pressure exceeds the forces holding the valve closed (up), the valve will move downward allowing D oil pressure to apply the direct clutch and release the intermediate servo to accomplish the 2-3 shift.

With the shift valve open (down) the throttle modulator valve is held down cutting off modulated throttle pressure to the 2-3 shift valve and 1-2 shift valve. In addition, the port which delivered line pressure to the differential in area of the shift valve lands, is closed.

The shift valve will be reopened (moved up) causing a 3-2 downshift under one or more of the following conditions:

Governor Pressure Reduced

If governor pressure is reduced to the point where it can no longer hold the shift valve down against spring force and T.V. pressure force, the valve will move up causing a downshift. Under closed throttle conditions, the 2-3 shift valve will close at approximately 10 mph (speed at which governor pressure is cut off). Since governor pressure is cut off at this speed the 1-2 shift valve train also closes at the same time. This will provide a 3-1 downshift when coasting in D range.

Throttle Pressure Increased

If throttle pressure is increased sufficiently, it will move the throttle modulator valve and consequently the 2-3 shift valve up, causing a 3-2 torque demand downshift.

Throttle Pressure Introduced Below 2-3 Shift Valve

If the downshift valve is moved through detent, boosted throttle pressure is directed to the underside of the 2-3 shift valve, forcing the valve up and causing a forced 3-2 downshift. Maximum 3-2 forced downshift speed is controlled by governor pressure.

(D to 2 Range). If the manual valve is moved to 2 range, the force created by 2 oil pressure acting on the area differential of the 2-3 shaft valve and on the spring end of the valve plus the force of the throttle modulator valve spring will exceed the force created by governor pressure. The 2-3 shift valve will then close (move up) allowing the direct clutch apply-intermediate servo release oil to exhaust, permitting the intermediate band to apply causing a 3-2 downshift. In addition, D2 oil pressure is introduced between the 1-2 shift valve and D2 valve, and regulated downshift valve oil pressure is introduced between the lands of the 1-2 shift valve. This opens (moves down) the D-2 valve and holds it open and closes (moves up) the 1-2 shift valve and holds it closed; thus preventing a 2-1 downshift. The transmission will remain in intermediate or second gear until another mode of operation is selected.

(D to 1 Range). If the manual valve is moved to 1 range at vehicle speeds greater than approximately 30 mph, a 3-2 downshift will be accomplished in the same manner as in 2 range, except that 1-R oil pressure instead of 2 oil pressure is directed to the 2-3 shift valve.

At vehicle speeds of approximately 30 mph or lower, the force created by regulated downshift valve pressure acting on the area differential of the 1-2 shift valve plus the force of the 1-2 shift valve spring will exceed governor pressure force holding the 1-2 shift valve train open (down). The 1-2 shift valve train will then close (move up), exhausting intermediate servo apply and allowing 1-R oil pressure to pass through the D2 valve to the spring end of the D2 valve, and to the reverse and low servo applying the reverse and low band. The transmission will remain in low or first gear until another mode of operation is selected.

(2 Range). In 2 range, 2 oil pressure is introduced between the 1-2 shift valve and D-2 valve, and regulated downshift valve oil pressure is introduced between the lands of the 1-2 shift valve. This action opens the D2 valve and holds it open and closes the 1-2 shift valve and holds it closed providing a second gear start and preventing a 2-1 downshift. The transmission will remain in intermediate or second gear until another mode of operation is selected.

(1 Range). In 1 range, regulated downshift valve pressures enter the modulated throttle pressure passage to provide a manual low downshift to first gear. Once the transmission is in low gear 1-R oil pressure, which is directed to the D2 valve, passes through the D2 valve and is delivered to the spring end of the D2 valve, preventing an upshift. 1-R oil pressure which passes through the D2 valve also applies the reverse and low servo.

(R Range). In reverse 1-R oil pressure is directed to and through the D2 valve to the spring end of the D2 valve and to the reverse and low servo applying the reverse and low band. The force created by 1-R oil pressure on the spring end of the D2 valve and the force created by regulated downshift valve oil pressure on the area differential of the 1-2 shift valve is added to the force of the 1-2 shift valve spring, preventing any movement of the 1-2 shift valve train regardless of governor pressure.

R oil pressure is directed to and through the 2-3 shift valve to the reverse-direct clutch applying the clutch and to the release side of the intermediate servo. The force created by regulated downshift valve oil pressure on the spring end of the 2-3 shift valve, and 1-R oil pressure on the area differential of the lands adjacent to the top valley of the 2-3 shift valve is added to the force of the throttle modulator valve spring, preventing any movement of the 2-3 shift valve regardless of governor pressure.

2-3 Back-out Valve

The purpose of the 2-3 back-out valve is to provide smooth upshifts, when the throttle is suddenly closed while accelerating in second gear. Operation is as follows:

Normal Throttle—On 2-3 Upshifts. When the 2-3 shift valve moves to cause a 2-3 upshift, D oil pressure passes through the valve to apply the direct clutch and release the intermediate servo. This same pressure is also directed to the end of the 2-3 back-out valve. However, with throttle open, T.V. boost pressure on the opposite end of the 2-3 back-out valve, assists spring force in holding the valve up, so that there will be no valve movement until after the 2-3 shift has been completed.

Back-Out 2-3 Upshifts. When the throttle is closed during a 2-3 upshift,

and before the shift is completed, there may be enough pressure in the direct clutch cylinder to apply the clutch at the reduced engine torque input, but not enough pressure to release the intermediate servo. This condition could cause a harsh 2-3 shift. However, if the throttle is closed during a 2-3 shift, primary throttle pressure will be reduced to Zero (0), and reverse and direct clutch apply pressure on the end of the 2-3 back-out valve will move the valve down against spring force. This action immediately connects the clutch apply circuit to the intermediate servo apply circuit, reducing the pressure on the apply side of the servo to the same value as in the direct clutch (and also on the release side of the intermediate servo). When this happens, the intermediate band is released, to provide a smooth 2-3 upshift.

Manual Low Valve

The manual low valve insures that the 2-3 back-out valve will be moved up the instant that pressure drops in the direct clutch apply—intermediate servo release circuit, when a shift to 2 or 1 range is made from high gear. This is accomplished by directing 2 or 1-R oil pressure to the end of the manual low valve, when 2 or 1 range is selected.

Intermediate Band Accumulator Valve Train

The intermediate band accumulator valve train is composed of the intermediate band accumulator valve, intermediate servo accumulator 3-2 control valve, intermediate servo accumulator 3-2 control valve sleeve, and the accumulator valve spring. The intermediate band accumulator valve train in conjunction with the intermediate servo check valve controls intermediate servo apply force on all applications of the intermediate band, under all operating conditions in D, 2 or 1 ranges.

Operation is as follows:

(D Range: 1-2 Upshifts and 3-2 Downshifts). (2 and 1 Range: 3-2 Downshifts—Shifting D to 2 or 1). Fluid pressure from the D2 valve acting on the apply side of the intermediate servo piston tending to apply the servo, causes the fluid which is trapped in the intermediate servo release passage to be pressurized. This pressure acting on the area differential of the intermediate servo accumulator valve will cause the accumulator valve to move against primary T.V. pressure acting on the 3-2 control valve and/or the accumulator valve spring. The servo release pressure is exhausted through the reverse-direct clutch apply circuit to maintain a certain level of pressure on the release side of the intermediate servo until it has completely stroked, applying the band. Force created by this pressure on the release side of the servo, plus intermediate servo spring force, is subtracted from the force of control pressure acting on the apply side of the servo, thereby controlling the servo apply force during any condition requiring the intermediate band to be on in D, 2, and 1 ranges. On some models, the accumulator valve spring and/or the passage connecting the two ends of the ccumulator valve are omitted and the bottom end of the valve is exhausted to provide the correct intermediate servo capacity.

(D Range: 2-3 Upshifts). During a 2-3 upshift, D oil pressure from the 2-3 shift valve will unseat the intermediate servo check valve, bypassing the intermediate servo accumulator valve, allowing the release side of the intermediate servo to be pressurized at the same pressure level as the direct clutch, thereby releasing the intermediate band.

2 IN-VEHICLE ADJUSTMENTS AND REPAIRS

CONTROL LINKAGE ADJUSTMENTS

The transmission control linkage adjustments should be performed in the order in which they appear in this section of the manual.

THROTTLE AND DOWNSHIFT LINKAGE ADJUSTMENTS

1. Apply the parking brake, and place the selector lever at N.
2. Run the engine at normal idle speed. If the engine is cold, run the engine at fast idle speed (about 1200 rpm) until it reaches normal operating temperature. When the engine is warm, slow it down to normal idle speed.
3. Connect a tachometer to the engine.
4. Adjust engine idle speed to the specified rpm with the transmission selector lever at the D position.
5. **The carburetor throttle lever must be against the hot idle speed adjusting screw at the specified idle speed in D.** To make sure that the carburetor throttle lever is against the idle adjusting screw, refer to Group 10 for the carburetor adjusting procedures.

ALL MODELS EXCEPT COMET AND FAIRLANE WITH 289 CID ENGINE

1. With the engine off, check the eccelerator pedal for a height of 4 1/2 inches measured from the top of the pedal at the pivot point (Figs. 14, 15, 16 or 17) to the floor pan. To obtain the correct pedal height, adjust the accelerator connecting link at point A.
2. With the engine OFF, disconnect the downshift control cable at point B from the accelerator shaft lever.
3. With the carburetor choke in the **off** position, depress the accelerator pedal to the floor. Block the pedal to hold it in the wide open position.
4. Rotate the downshift lever C counter clockwise to place it against the internal stop.
5. With the lever held in this position, and all slack removed from the cable, adjust the trunnion so that it will slide into the accelerator shaft lever. Turn it one additional turn clockwise, then secure it to the lever with the retaining clip.
6. Remove the block to release the accelerator linkage.

COMET AND FAIRLANE LINKAGE—289 CID ENGINE

1. Disconnect the bellcrank to carburetor rod at point C and the accelerator connecting link from the throttle shaft at point B (Fig. 18).
2. Disconnect the stabilizer rod from the stabilizer at point A.
3. Insert a 1/4 inch diameter pin through the stabilizer and the bracket (Fig. 18).
4. Adjust the length of the stab-

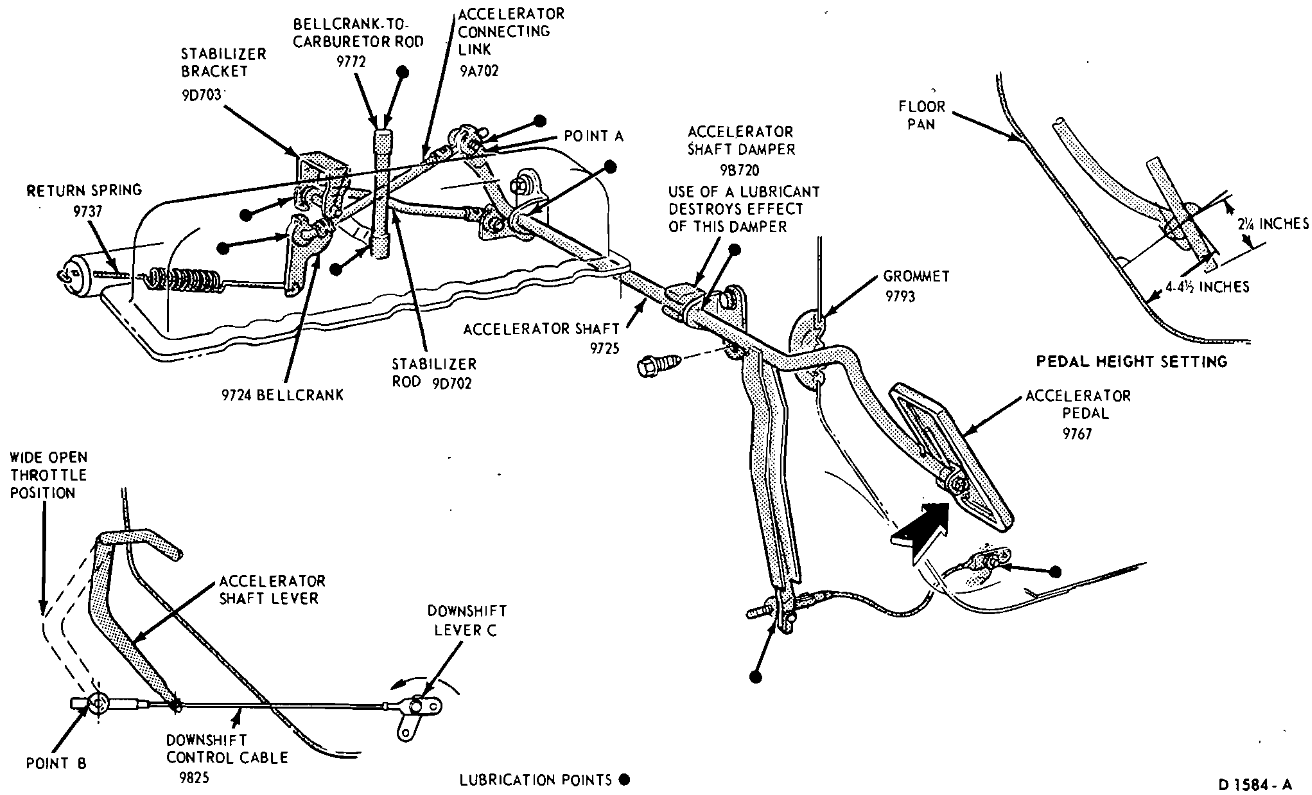


FIG. 14—Throttle Linkage — Fairlane, Falcon and Comet with 6 Cylinder Engine

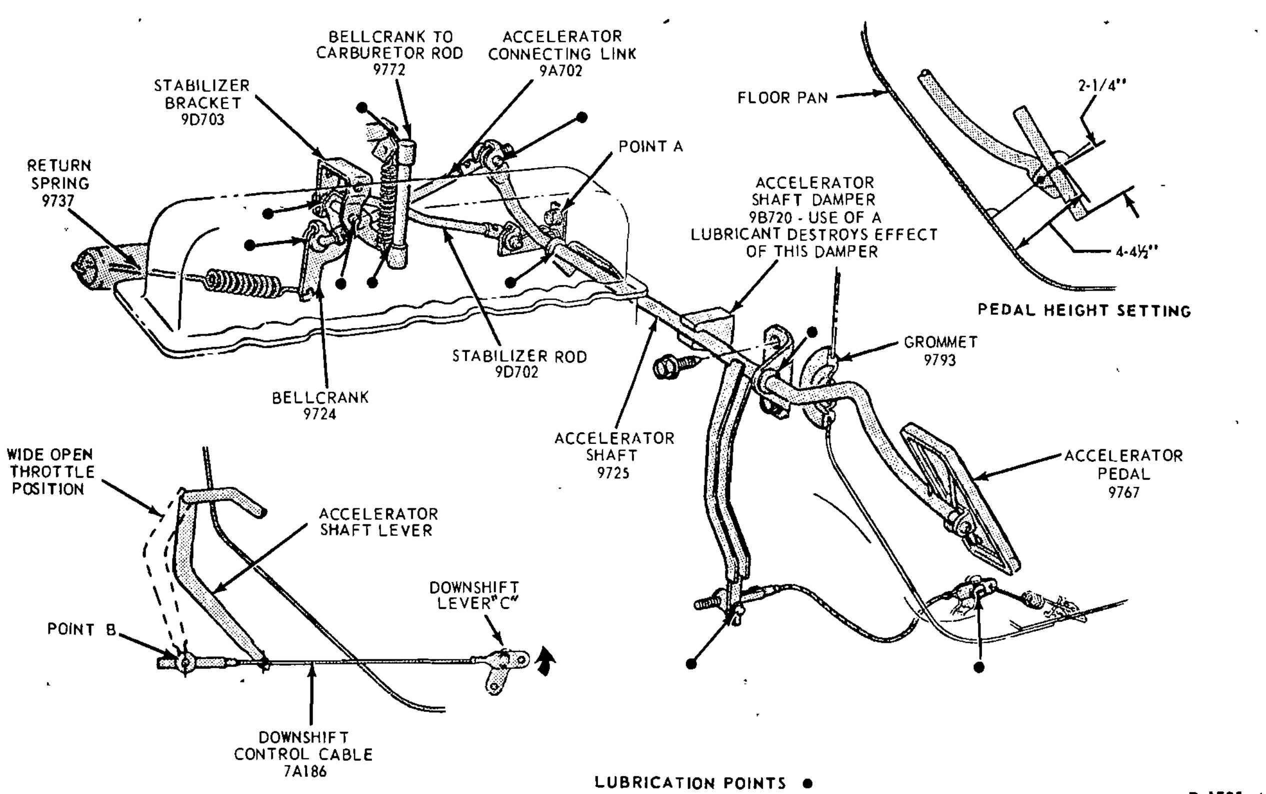


FIG. 15—Throttle Linkage — Mustang with 6 Cylinder Engine

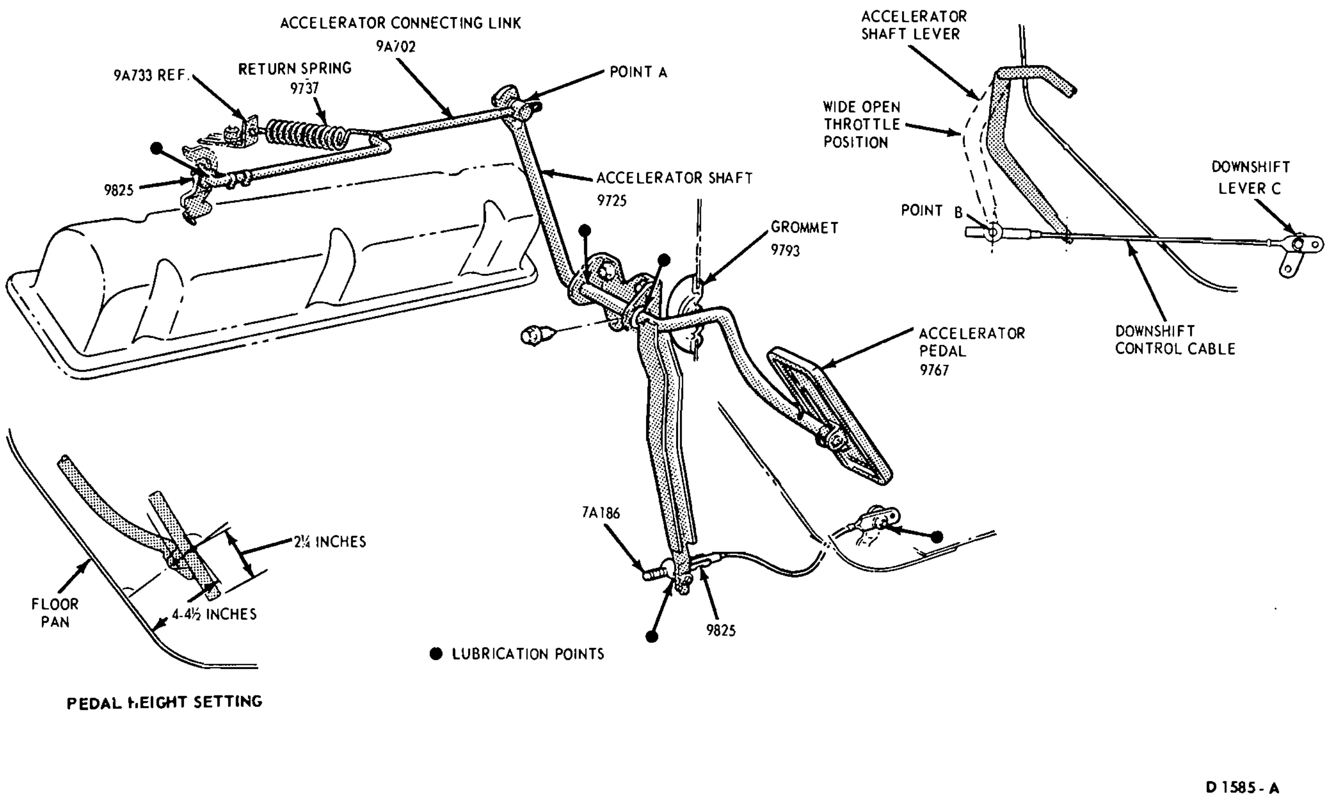


FIG. 16—Throttle Linkage — Falcon with 289 CID Engine

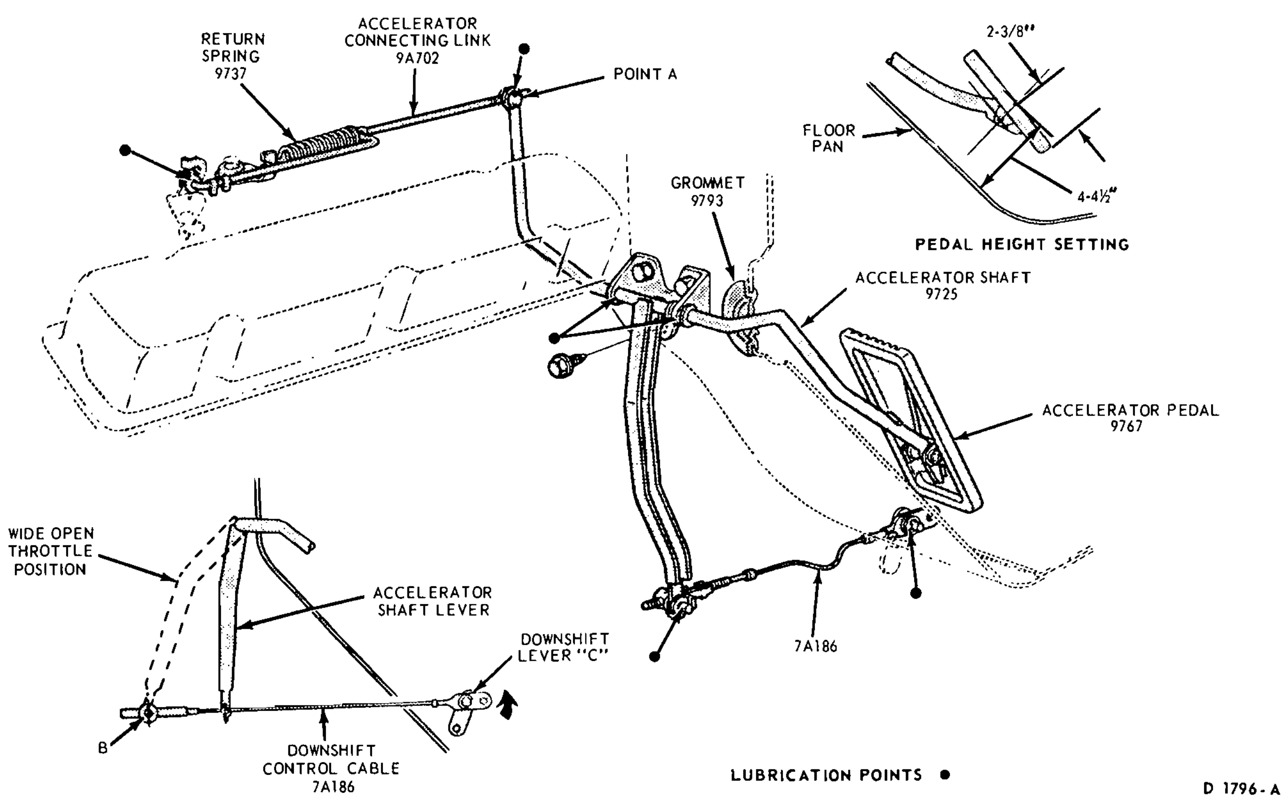


FIG. 17—Throttle Linkage — Mustang and Cougar with 289 CID Engine

ilizer rod so that the trunnion enters the stabilizer freely. Secure the stabilizer rod with the retaining clip.

5. Secure the carburetor-to-bellcrank rod to the bellcrank with the attaching clip at point C.

6. Adjust the length of the accelerator rod connecting link to obtain an accelerator pedal height of 4-4 1/2 inches measured at the pedal as shown in Fig. 18. Connect the accelerator connecting link to the accelerator shaft with the retaining clip after the proper accelerator pedal height has been established.

7. With the engine **off**, disconnect the downshift control cable at point D from the accelerator shaft lever.

8. Rotate the downshift lever E counter clockwise to place it against the internal stop.

9. With the lever held in this position, and all slack removed from the cable, adjust the trunnion so that it will slide into the downshift lever. Turn it one additional turn clockwise, then secure it to the accelerator shaft lever with the retaining clip.

10. Remove the block to release the accelerator linkage.

MANUAL LINKAGE ADJUSTMENT

COMET, FALCON, FAIRLANE

Column Shift

1. Place the selector lever in the D position tight against the D stop.

2. Loosen the nut at point A enough to permit column shift lever to slide on the shift rod (Fig. 19).

3. Shift the manual lever at the transmission into the D detent position, third from the rear.

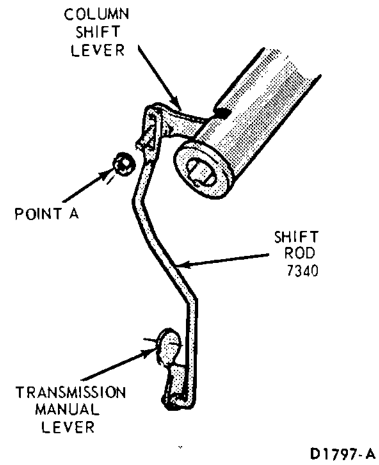


FIG. 19—Manual Linkage — Column Shift

4. Make sure that the selector lever has not moved from the D stop; then, tighten the nut at point A.

5. Check the pointer alignment and the transmission operation for all selector lever detent positions.

Console Shift

1. Move the selector lever to the D detent position against the stop.

2. Raise the car and loosen the manual linkage rod attaching nut (Fig. 20). Move the transmission manual lever to the D position, fourth from the rear. The last detent position is low position.

3. With the selector lever and the transmission manual lever in the D position, tighten the rod attaching nut to 20 to 25 ft-lbs torque.

Selector Lever Removal, Adjustment and Installation

1. Raise the car on a hoist or jack stands.

2. Remove the retainer that secures the manual linkage rod to the lower end of the manual lever (Fig. 20).

3. Remove the flat washer and two insulator washers and disconnect the rod from the arm.

4. Working from inside of the car, remove the selector lever handle attaching screw. Lift the handle off the selector lever.

5. Remove the console trim panel from the top of the console.

6. Remove the cover and dial indicator as an assembly.

7. Remove the six screws that secure the selector lever retainer to the

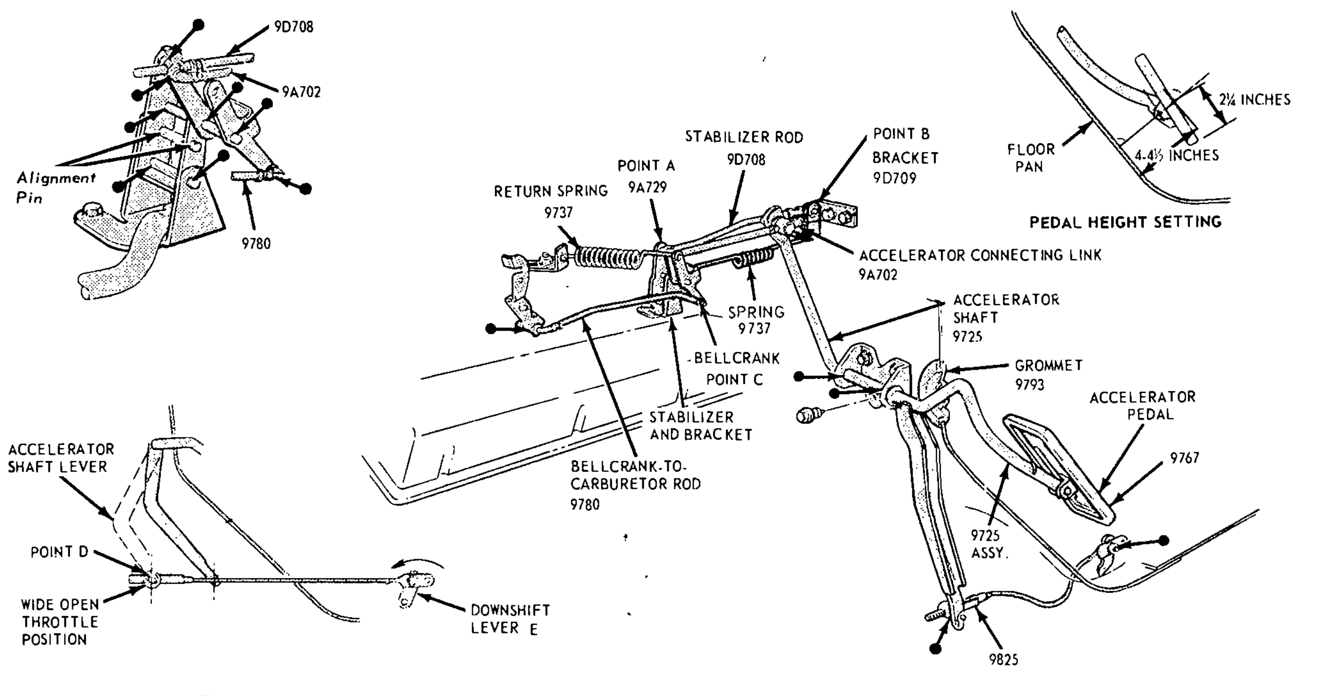


FIG. 18—Throttle Linkage — Comet and Fairlane with 289 CID Engine

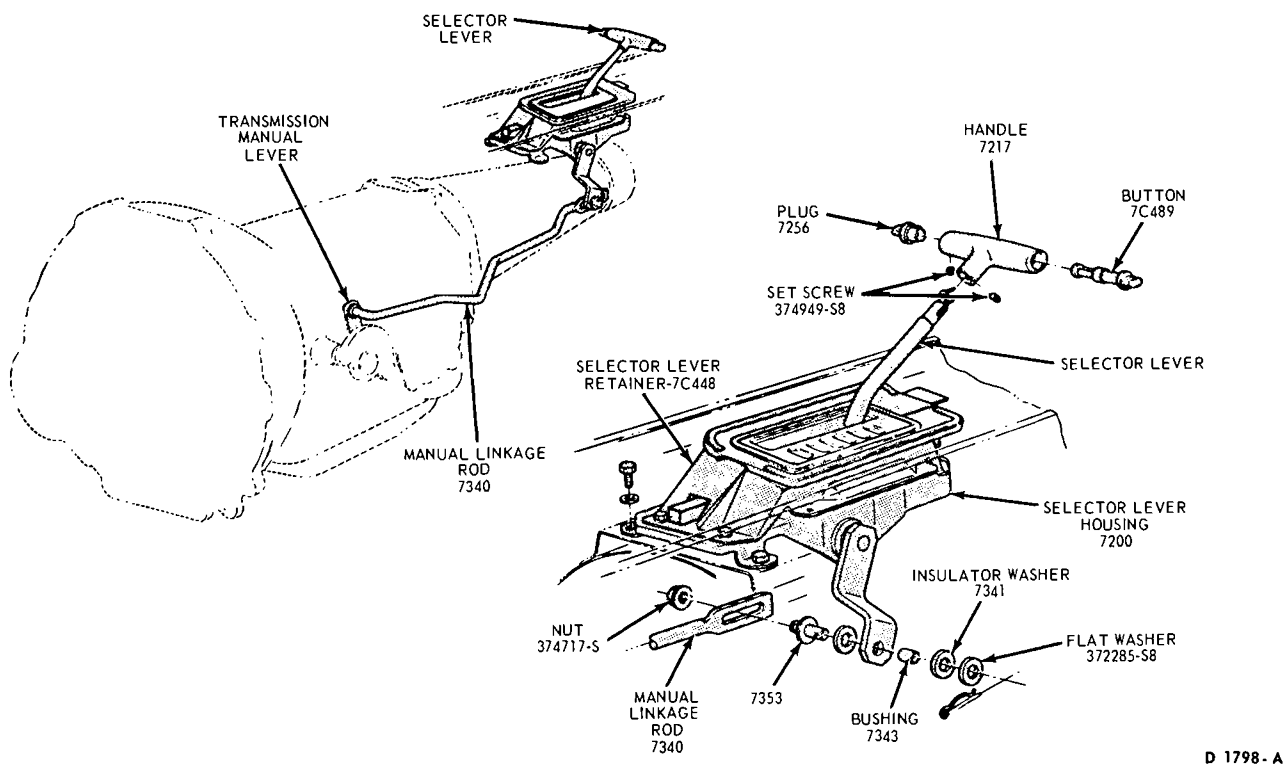


FIG. 20—Manual Linkage Console — Comet and Fairlane

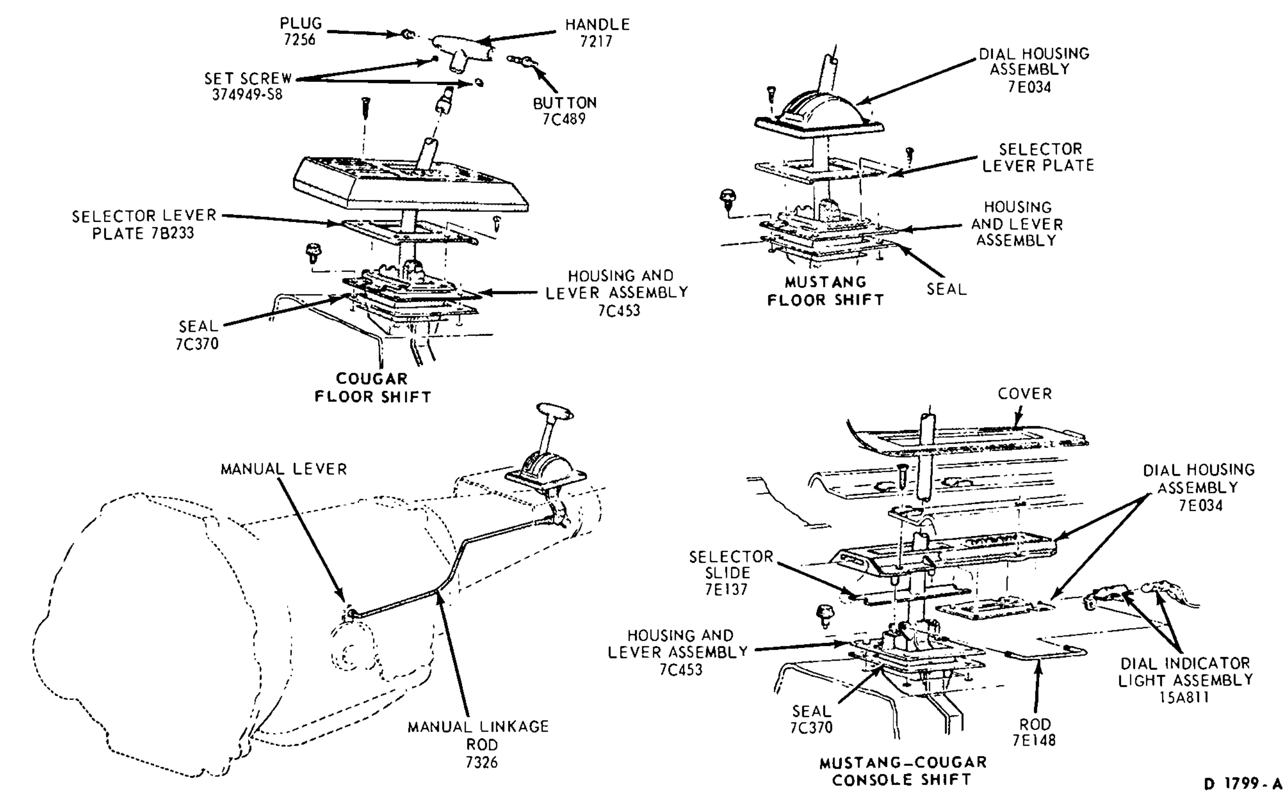


FIG. 21—Manual Linkage — Mustang—Cougar

selector lever housing. Lift the retainer from the housing.

8. Disconnect the neutral start switch wires at the plug connector. Disconnect the bulb socket from the selector lever housing.

9. Remove the three bolts that secure the selector lever control housing to the console. Lift the selector lever housing from the console.

10. Remove the selector lever to housing attaching nut. Remove the lever from the housing.

11. Install the selector lever in the housing and install the attaching nut. Torque the nut to 20 to 25 ft-lbs.

12. Install the selector lever handle.

13. Position the selector lever as shown in Figure 22. With a feeler gauge, check the clearance between the detent pawl and plate. The clearence should be 0.005 to 0.010 inch. If necessary adjust the height of the detent pawl as shown in Figure 22.

14. Remove the handle from the selector lever.

15. Position the selector lever housing in the console. Install the three attaching bolts (Fig. 20).

16. Connect the bulb socket to the selector lever housing and the neutral start switch wires to the plug connector.

17. Position the selector lever retainer to the selector lever housing. Install the six attaching screws.

18. Install the cover and dial indicator.

19. Position the console trim panel and secure it with the attaching screws.

20. Install the handle and the button on the selector lever. Secure the handle with the set screw.

21. Secure the manual linkage rod to the arm with two insulating washers, a flat washer and a retainer (Fig. 20).

22. Adjust the linkage as required. Lower the car.

MUSTANG — COUGAR

Linkage Adjustment

1. Position the transmission selector lever in D position (Fig. 21).

2. Raise the car and loosen the manual lever control rod retaining nut. Move the transmission manual lever to the D position, fourth detent position from the back of the transmission. The last detent position is manual low.

3. With the transmission selector lever against the stop and manual lever in the D positions, torque the attaching nut 20 to 25 ft-lbs.

4. Check the operation of the transmission in each selector lever position.

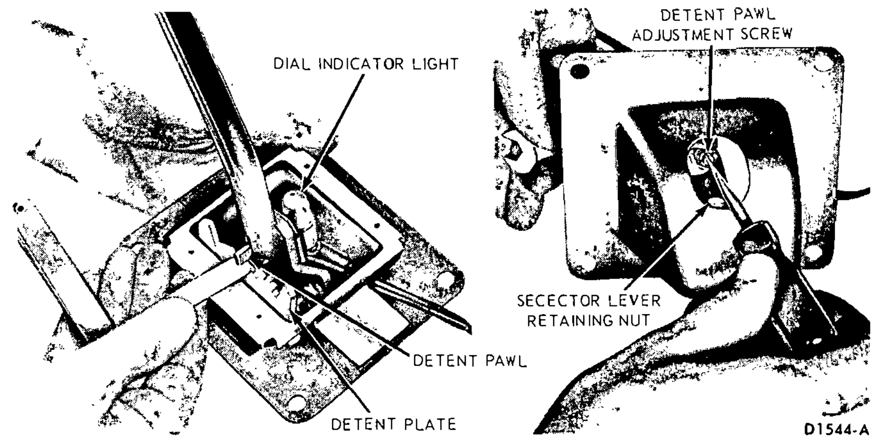


FIG. 22—Selector Lever Detent Pawl Adjustment

Selector Lever Removal Adjustment and Installation

1. Raise the car and remove the manual lever control rod attaching nut (Fig. 21).

2. Lower the car, remove the selector lever handle attaching screw.

3. Remove the dial housing attaching screws and the housing.

4. Remove the selector lever plate attaching screws and the plate.

5. Disconnect the dial indicator light (Fig. 22).

6. Remove the selector housing and lever assembly attaching bolts. Remove the selector lever and housing.

7. Remove the selector lever to housing attaching nut (Fig. 22). Remove the lever from the housing.

8. Install the selector lever in the housing and install the attaching nut. Torque the nut to 20 to 25 ft-lbs.

9. Install the dial indicator light.

10. Install the selector lever handle.

11. Position the selector lever as shown in Figure 22. With a feeler gauge check the clearance between the detent pawl and plate. The clearance should be 0.005 to 0.010 inch. If necessary adjust the height of the detent pawl as shown in Figure 22.

12. Remove the handle from the selector lever.

13. Install the selector housing and lever assembly as shown in Figure 21. Torque the attaching bolts 4-6 ft-lbs.

14. Connect the dial indicator light.

15. Install the selector lever plate and tighten the attaching screws.

16. Install the dial housing and tighten the attaching screws.

17. Install the selector lever handle and tighten the attaching screw.

18. Position the selector lever in the D position.

19. Raise the car. Install the transmission manual lever rod to the selector lever. Adjust the manual linkage.

20. Lower the car and check the transmission operation in each selector lever detent position.

NEUTRAL START SWITCH ADJUSTMENT

COMET, FALCON, FAIRLANE

Column Shift

1. With the manual linkage properly adjusted, check the starter engagement circuit in all transmission selector lever positions. The circuit must be open in all drive positions and closed only in park and neutral. The starter should engage only in park or neutral.

2. To adjust the switch, loosen the retaining screws that locate the switch on the steering column (Fig. 23).

3. Place the transmission selector lever firmly against the stop of the neutral detent position.

4. Rotate the switch actuating lever until the gauge pin (No. 43 drill) can be inserted into the gauge pin holes (Fig. 23).

5. Tighten the two switch retaining screws and remove the gauge pin.

6. Check the operation of the switch in each selector lever position. The starter should engage in only the neutral and park detent positions. Whenever the manual linkage is adjusted, the starter neutral switch

should be checked and if necessary adjusted.

Console Shift

1. With the manual linkage properly adjusted, check the starter engagement circuit in all positions. The circuit must be open in all drive positions and closed only in park and neutral.
2. Remove the selector lever handle from the lever.
3. Remove the trim panel from the top of the console.
4. Remove the cover and dial indicator as an assembly.
5. Remove the six screws that secure the selector lever retainer to the selector lever housing. Lift the retainer from the housing.
6. Loosen the two combination starter neutral and back-up light switch attaching screws (Fig. 24).
7. Move the selector lever back and forth until the gauge pin (No. 43 drill) can be fully inserted into the gauge pin holes (Fig. 24).
8. Place the transmission selector lever firmly against the stop of the neutral detent position.
9. Slide the combination starter neutral and back-up light switch forward or rearward as required, until the switch actuating lever contacts the selector lever.
10. Tighten the switch attaching screws and remove the gauge pin. Check for starting in the park position.
11. Turn the ignition key to the ACC position and place the selector lever in the reverse position and check the operation of the back-up lights. Turn the key off.
12. Position the selector lever retainer to the selector lever housing. Install the six attaching screws.
13. Install the cover and dial indicator.
14. Install the trim panel on the top of the console. Install the selector lever handle.

MUSTANG-COUGAR

1. **With the manual lever properly adjusted,** loosen the two switch attaching bolts (Fig. 25).
2. With the transmission manual lever in neutral, rotate the switch and insert the gauge pin (No. 43 drill shank end) into the gauge pin holes of the switch. **The gauge pin has to be inserted to a full 31/64 inch into the three holes of the switch (Fig. 25).**
3. Torque the two switch attaching bolts to specification. Remove the gauge pin from the switch.

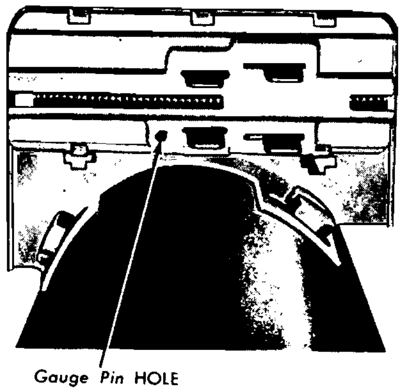


FIG. 23—Typical Starter Neutral Switch-Column Shift

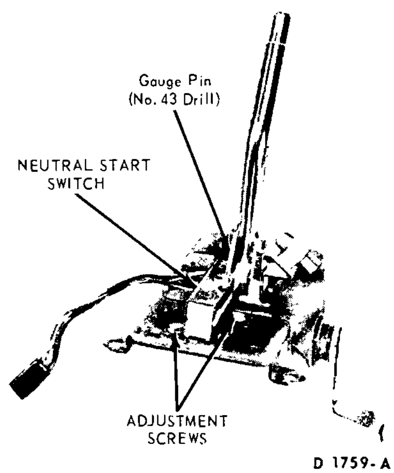


FIG. 24—Starter Neutral Switch-Console Shift

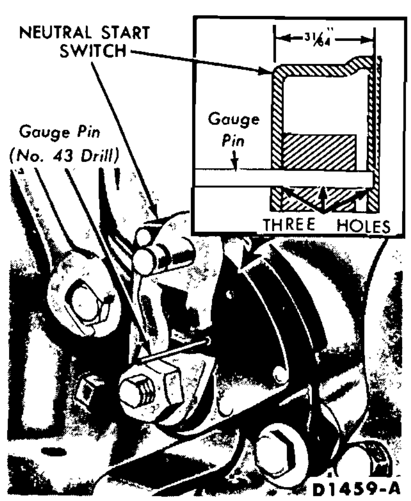


FIG. 25—Neutral Start Switch — Mustang-Cougar

4. Check the operation of the switch. The engine should start only with the transmission selector lever in Neutral and Park.

NEUTRAL START SWITCH REPLACEMENT

COMET, FALCON, FAIRLANE

Column Shift

1. Disconnect the neutral start switch wires at the plug connector.
2. Remove the two screws securing the neutral start switch to the steering column and remove the switch.
3. Position the neutral start switch on the steering column and install the two attaching screws.
4. With the transmission selector lever in neutral, rotate the switch and install gauge pin (No. 43 drill) into the gauge pin hole (Fig. 23).
5. Tighten the switch attaching screws and remove the gauge pin.
6. Connect the switch wires to the plug connector.
7. Check the operation of the switch in each selector lever position. The starter should engage in only the neutral and park detent positions.

Console Shift

1. Remove the selector lever handle from the lever.
2. Remove the trim panel from the top of the console.
3. Remove the cover and dial indicator as an assembly.
4. Remove the six screws that secure the selector lever retainer to the selector lever housing. Lift the retainer from the housing.
5. Remove the two screws securing the neutral start switch to the selector lever housing. Disconnect the neutral start switch wires at the plug connector and remove the switch.
6. Position the neutral start switch to the selector lever housing and install the two attaching screws.
7. With the selector lever in neutral, move the selector lever back and forth until the gauge pin (No. 43 drill) can be fully inserted into the gauge pin holes (Fig. 24).
8. Place the transmission selector lever firmly against the stop of the neutral detent position.
9. Slide the combination starter neutral and back-up light switch forward or rearward as required, until the switch actuating lever contacts the selector lever.
10. Tighten the switch attaching screws and remove the gauge pin.
11. Connect the neutral start

switch wires to the plug connector and check for starting in the park position.

12. Position the selector lever retainer to the selector lever housing. Install the attaching screws.

13. Install the cover and dial indicator.

14. Install the trim panel on the top of the console. Install the selector lever handle.

MUSTANG-COUGAR

1. Remove the downshift linkage rod from the transmission downshift lever.

2. Apply penetrating oil to the downshift lever shaft and nut. Remove the transmission downshift outer lever retaining nut and lever (Fig. 25).

3. Remove the two neutral start switch attaching bolts.

4. Disconnect the multiple wire connector. Remove the neutral switch from the transmission.

5. Install the neutral start switch on the transmission. Install the two attaching bolts.

6. With the transmission manual lever in neutral, rotate the switch and install gauge pin (No. 43 drill) into the gauge pin hole (Fig. 25).

7. Tighten the switch attaching bolts to specification and remove the gauge pin.

8. Install the outer downshift lever and attaching nut, and torque the nut to specification. Install the downshift linkage rod to the downshift lever.

9. Install the switch wires. Connect the wire multiple connector. Check the operation of the switch in each detent position. The engine should start only with the transmission selector lever in N (neutral) and P (park).

BAND ADJUSTMENTS

INTERMEDIATE BAND

1. Clean all the dirt from the band adjusting screw area. Remove and discard the locknut.

2. Install a new locknut on the adjusting screw. With the tool shown in Fig. 26, tighten the adjusting screw until the tool handle clicks. The tool is a preset torque wrench which clicks and overruns when the torque on the adjusting screw reaches 10 ft-lbs.

3. **Back off the adjusting screw exactly 1 3/4 turns.**

4. Hold the adjusting screw from turning and torque the locknut to specification.

LOW-REVERSE BAND

1. Clean all the dirt from the band adjusting screw area. Remove and discard the locknut.

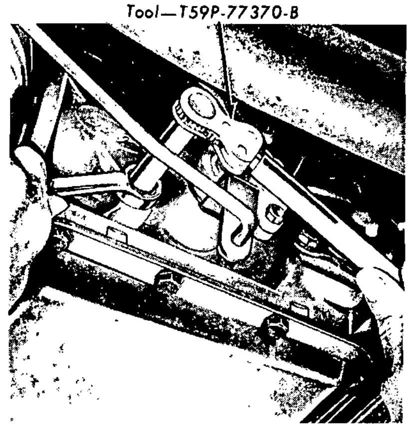


FIG. 26— Intermediate Band Adjustment

2. Install a new locknut on the adjusting screw. With the tools shown in Fig. 27, tighten the adjusting screw until the tool handle clicks. The tool is a preset torque wrench which clicks and overruns when the torque on the adjusting screw reaches 10 ft-lbs.

3. **Back off the adjusting screw exactly 3 full turns.**

4. Hold the adjusting screw from turning and torque the lock nut to specification.

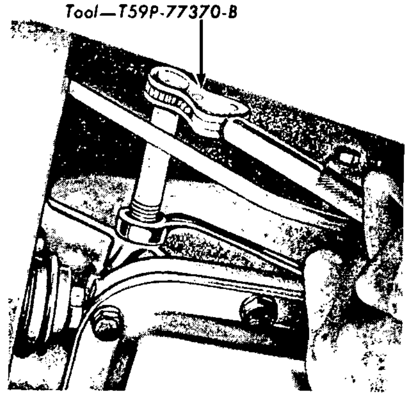


FIG. 27— Low-Reverse Band Adjustment

OIL PAN AND CONTROL VALVE BODY REPLACEMENT

1. Raise the car so the transmission oil pan is accessible.

2. Loosen the oil pan retaining bolts and lower one edge of the oil pan to drain the transmission oil. **If the same fluid is to be used again, filter the fluid through a 100 mesh screen. Re-use the fluid only if it is in good condition.**

3. Remove the transmission oil pan attaching bolts, oil pan and gasket.

4. Remove the valve body to case attaching bolts (Fig. 38). Remove the valve body from the case and the transmission inner control levers.

5. Refer to the Major Repair Operation for control valve body repair operation.

6. Thoroughly clean and remove all the gasket material from the oil pan and the oil pan mounting face of the case. Install the valve body to the case, engaging the transmission inner control levers with the valve body manual and downshift valves.

7. Install the valve body to case attaching bolts. Torque the bolts to specification. **Operate the external manual and downshift levers to check for proper travel of the valve body manual and downshift valves.**

8. Place a new gasket on the oil pan. Install the oil pan and attaching bolts. Torque the bolts to specification.

9. Lower the car and fill the transmission with fluid. Check the transmission oil pan area for fluid leakage.

INTERMEDIATE SERVO REPAIR

1. Raise the car and remove the four servo cover to case attaching bolts.

2. Remove the servo cover, gasket, piston, and piston return spring. Remove the piston from the cover (Fig. 58).

3. Remove the piston seals and cover gasket.

4. Install new piston seals on the piston. Lubricate the piston seals with clean transmission fluid. Install the servo piston in the cover.

5. Install the piston return spring in the case. Place a new gasket on the cover. Install the piston and cover into the transmission case making sure that the slotted end of the piston is in a horizontal position so that it will engage the strut. Use two 5/16—18 x 1 1/4 bolts, 180° apart to position the cover against the case.

6. Install the two servo cover attaching bolts. Remove the two 1 1/4-inch bolts and install two attaching bolts. Torque the bolts to specification.

7. Adjust the intermediate band. Lower the car and check the transmission fluid level.

8. If the band cannot be adjusted

properly, the struts are not in position. Remove the oil pan and valve body. Install the struts, valve body, oil pan, and adjust the band. Refill the transmission with fluid.

LOW-REVERSE SERVO PISTON REPLACEMENT

1. Raise the car on a hoist.
2. Loosen the reverse band adjusting screw lock nut. Tighten the reverse band adjusting screw to 10 ft-lbs torque. (Tightening the screw will insure that the band strut will be held against the case by the band, preventing it from falling down when the reverse servo piston assembly is removed).
3. Remove the four servo cover to case attaching bolts. Remove the identification tag and vent tube retaining clip. Remove the servo cover and seal from the case.
4. Remove the reverse servo piston and stem from the case as an assembly.
5. Insert a small screwdriver in the hole of the piston stem (Fig. 57). Remove the piston attaching nut.
6. Remove the servo piston from the stem. The piston seal cannot be replaced without replacing the piston. The seal is bonded to the piston.
7. Install a new piston on the stem. Install the attaching nut. Torque the nut to specification. Make sure the spacer and accumulator spring (Fig. 56) is positioned on the piston stem. The crowned side of the spring should face toward the rod.
8. Install the reverse servo piston assembly in the case. Make sure that the release spring is in position.
9. Install the reverse servo cover and a new seal, positioning the breather tube clip and service identification tag under the proper cover-to-case bolts. Torque the bolts to specification.
10. Adjust the reverse band.
11. Lower the car and check the transmission fluid level.

EXTENSION HOUSING BUSHING AND REAR SEAL REPLACEMENT

1. Disconnect the drive shaft from the transmission.
2. When only the rear seal needs replacing, carefully remove it with a tapered chisel or the tools shown in Fig. 28. Remove the bushing as shown in Fig. 29. **Use the bushing remover carefully so that the spline seal is not damaged.**
3. When installing a new bushing use the special tool shown in Fig. 30.
4. Before installing a new seal, inspect the sealing surface of the universal joint yoke for scores. If scores are found, replace the yoke.
5. Inspect the counterbore of the housing for burrs and remove with crocus cloth.
6. Install the seal into the housing with the tool shown in Fig. 31. The seal should be firmly seated in the bore. Coat the inside diameter of the fiber portion of the seal with B8A-19589-A lubricant.
7. Coat the front universal joint spline with B8A-19589-A lubricant and install the drive shaft.

EXTENSION HOUSING AND GOVERNOR REPLACEMENT

1. Raise the car on the hoist.
2. Remove the drive shaft. Position the transmission jack to support the transmission.
3. Remove the speedometer cable from the extension housing.
4. Remove the extension housing to crossmember mount attaching bolts. Raise the transmission and remove the mounting pad between the extension housing and the crossmember.
5. Loosen the extension housing attaching bolts to drain the transmission fluid. Disconnect the exhaust inlet pipes at the manifold and lower the inlet pipes.
6. Remove the six extension housing-to-case attaching bolts and remove the extension housing.
7. Remove the governor housing-to-governor distributor attaching bolts (Fig. 32). Remove the governor housing from the distributor.
8. Refer to Major Repair Operations for governor repair operations.
9. Install the governor housing on the governor distributor (Fig. 32). Install the attaching bolts and torque the bolts to specification.
10. Install a new extension housing gasket on the case. Install the extension housing and six attaching bolts. Torque the bolts to specification.
11. Install the transmission mounting pad to the crossmember. Lower the transmission and install the extension housing-to-crossmember attaching bolts. Torque the attaching bolts to specification. Remove the transmission jack.
12. Connect the speedometer cable to the extension housing. Install the drive shaft.
13. Install the inlet pipes on the manifold.
14. Lower the car and fill the transmission with fluid.
15. Check the extension housing area for fluid leakage.

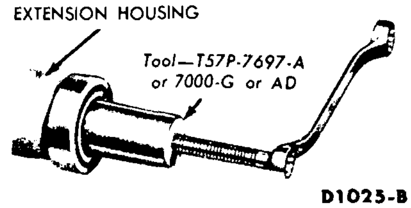


FIG. 29—Removing Extension Housing Bushing

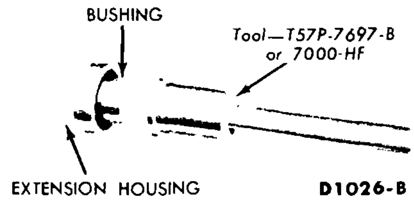


FIG. 30—Installing Extension Housing Bushing

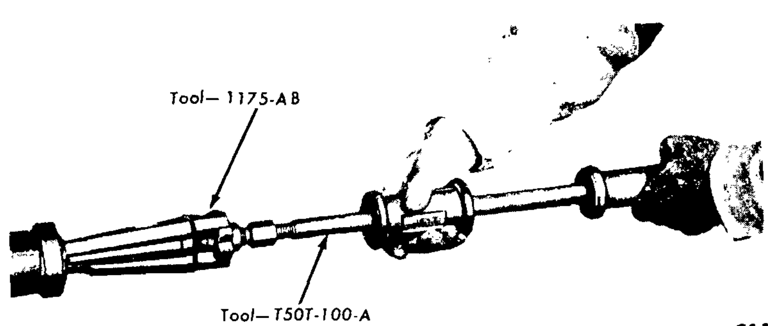


FIG. 28—Removing Extension Housing Seal

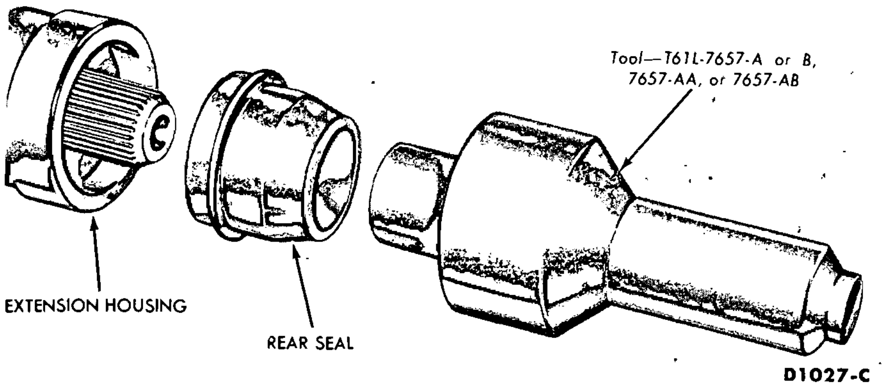


FIG. 31—Installing Extension Housing Seal

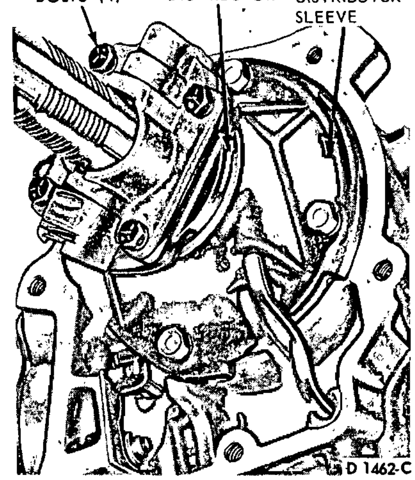


FIG. 32—Governor Installed

3 REMOVAL AND INSTALLATION

REMOVAL

1. Raise the car and remove the two converter cover attaching bolts at the lower front side of the converter housing. Remove the cover.

2. Remove the two converter drain plugs (Fig. 33). Drain the fluid from the converter. Install the two converter drain plugs.

3. Remove the drive shaft and install the extension housing seal replacer tool in the extension housing.

4. Disconnect the vacuum hose from the transmission vacuum unit. Disconnect the vacuum line from the retaining clip.

5. Remove the two extension housing to crossmember bolts.

6. Disconnect the speedometer cable from the extension housing.

7. Disconnect the exhaust pipe flange from the manifolds.

8. Remove the parking brake cable from the equalizer lever.

9. Loosen the transmission oil pan bolts and drain the fluid at one corner of the oil pan. Tighten the attaching bolts after the fluid has drained.

10. Disconnect the fluid cooler lines from the transmission case. Remove the fluid tube from the case.

11. Remove the manual and kickdown linkage rods from the transmission control levers.

12. On Mustang and Cougar, disconnect the neutral start switch wires from the retaining clamps and connectors.

13. Remove the starter cable. Remove the starter attaching bolts and remove the starter from the converter housing.

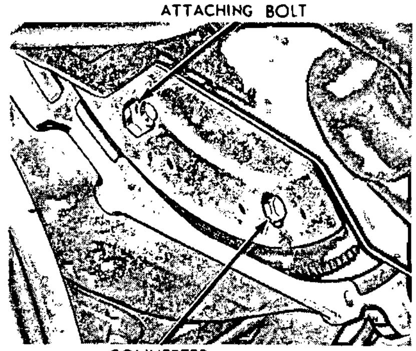


FIG. 33—Converter Drain Plug Location

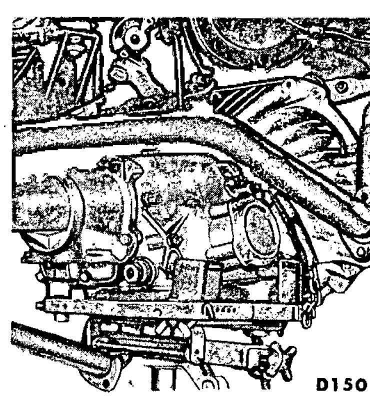


FIG. 34—Transmission Mounted on Jack

14. Remove the four converter-to-flywheel attaching nuts.

15. Position the transmission jack to support the transmission and secure the transmission to the jack with a safety chain.

16. Remove the four crossmember and mounting pad attaching bolts and lower the crossmember.

17. Remove the five converter housing-to-engine attaching bolts. Lower the transmission (Fig. 34), and remove it from under the car.

INSTALLATION

1. With the converter properly installed, place the transmission on the jack (Fig. 34). Secure the transmission to the jack with the safety chain.

2. Raise the transmission into position and install the five converter housing-to-engine attaching bolts. Torque the bolts to specification. Remove the safety chain from the transmission.

3. Position the crossmember and mounting pad into position and install the four attaching bolts. Torque the bolts to specifications.

4. Lower the transmission and install the extension housing and cross member attaching bolts. Torque the bolts to specification.

5. Install the four flywheel-to-converter attaching nuts. Torque the nuts to specification.

6. Remove the transmission jack. Connect the vacuum hose to the transmission vacuum unit. Install the vacuum line retaining clip.

7. Install the transmission fluid filler tube. Connect the fluid cooling lines to the transmission case.

8. On Mustang and Cougar, connect the neutral start switch wires to their respective connectors

and secure the harness in the retaining clamps.

9. Connect the linkage rods to the transmission downshift and manual control levers.

10. Connect the speedometer cable to the extension housing.

11. Connect the exhaust inlet pipes to the manifolds.

12. Install and adjust the parking brake cable at the equalizer lever.

13. Install the converter housing cover and torque the attaching bolts to specification.

14. Install the starter and torque the bolts to specification. Connect the starter cable.

15. Install the drive shaft. Torque the companion flange U-bolt nuts to specification.

16. Lower the car and fill the transmission with fluid. Adjust the manual and kickdown linkage.

4 MAJOR REPAIR OPERATIONS

Before removing any of the sub-assemblies, thoroughly clean the outside of the transmission to prevent dirt from entering the mechanical parts. During the repair operations, refer to Part 7-1 for common adjustments and repairs or cleaning and inspection procedures.

During the transmission disassembly or assembly operations, ten thrust washers located between the sub-assemblies must be removed and installed. It is important that each thrust washer be in the correct position during the assembly operation.

To properly locate and identify the thrust washers, the various positions of the thrust washers are shown in the illustrations and are numbered 1 through 10. Number 1 is the first thrust washer located at the front pump. The last thrust washer, No. 10, is located at the parking gear.

DISASSEMBLY OF TRANSMISSION

1. Remove the converter from the transmission front pump and converter housing.
2. Remove the transmission vacuum unit with the tool shown in Fig. 35. Remove the vacuum unit gasket and control rod.
3. From the vacuum unit hole in the case, remove the primary throttle valve (Fig. 36).
4. Remove the two extension housing-to-case attaching bolts and mount the transmission in the holding fixture as shown in Fig. 37.
5. Remove the oil pan attaching bolts, and the oil pan and gasket.
6. Remove the eight control valve body attaching bolts (Fig. 38). Remove the control valve body from the case.
7. Loosen the intermediate band adjusting screw (Fig. 39) and remove the intermediate band struts from the case. Loosen the low-reverse band adjusting screw and remove the low-reverse band struts (Fig. 39).

TRANSMISSION END PLAY CHECK

1. To keep the output shaft in alignment during the end play check, install the extension housing oil seal replacer tool or a front universal joint yoke in the extension housing.
2. Remove one of the front pump-to-case attaching bolts and mount the dial indicator as shown in Fig. 40.
3. The input shaft is a loose part and has to be properly engaged with the spline of the forward clutch hub during the end play checking procedure. Move the input shaft and gear train toward the back of the transmission case.
4. With the dial indicator contacting the end of the input shaft, set the indicator at zero (Fig. 40).
5. Insert a screwdriver behind the input shell (Fig. 40). Move the input shell and the front part of the gear train forward.
6. Record the dial indicator reading. The end play should be 0.008 to 0.042 inch. If the end play is not within specifications, **the selective thrust washer (Fig. 41) must be replaced.**

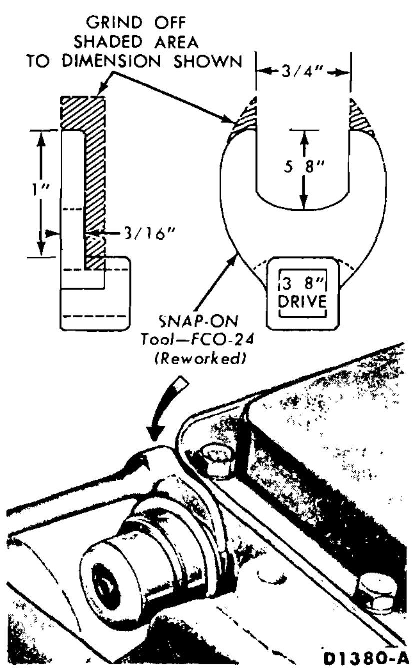


FIG. 35—Removing Vacuum Unit

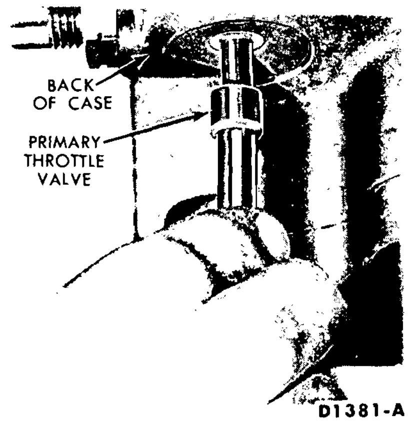


FIG. 36—Removing or Installing Primary Throttle Valve

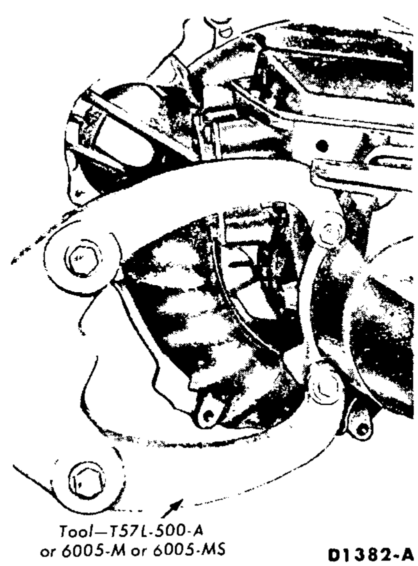


FIG. 37—Transmission Mounted in Holding Fixture

When it is necessary to change a thrust washer, use the selective thickness of thrust washer No. 2 to obtain the proper end play. Fig. 41 shows the selectivity that is available to obtain the correct selective thrust washers.

7. Remove the dial indicator and remove the input shaft from the front pump stator support (Fig. 42).

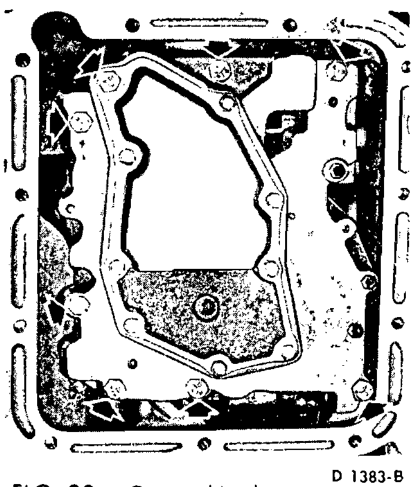


FIG. 38—Control Valve Attaching Bolts

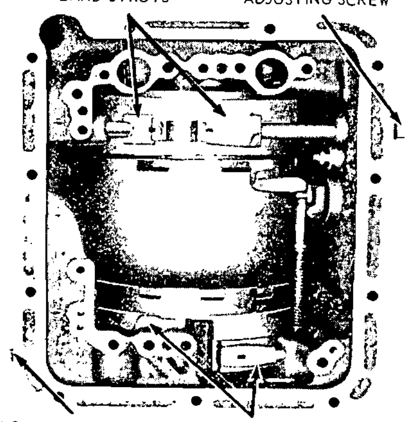


FIG. 39—Band Adjusting Studs and Struts

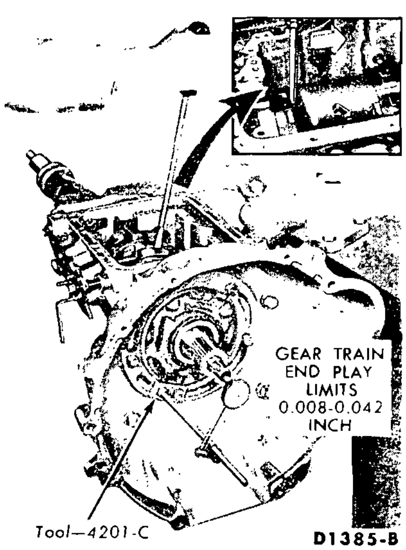
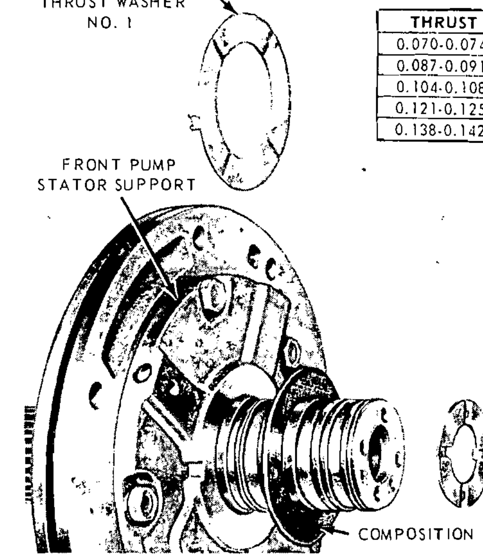


FIG. 40—Checking End Play



SELECTIVE THRUST WASHERS
(FOR END-PLAY CORRECTION)

THRUST WASHER NO. 1	
0.070-0.074	Green
0.087-0.091	Natural
0.104-0.108	Black
0.121-0.125	Yellow
0.138-0.142	Blue

THRUST WASHER NO. 2	
No. Stamped Washer	Metal Thrust Washer
5	0.109-0.107
4	0.092-0.090
3	0.075-0.073
2	0.058-0.056
1	0.043-0.041
Metal Thrust Washers are Same	

FIG. 41—Selective Thrust Washer Locations

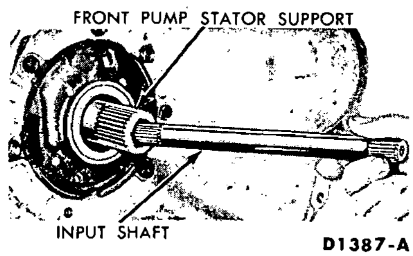


FIG. 42—Removing or Installing Input Shaft

REMOVAL OF CASE AND EXTENSION HOUSING PARTS

1. Rotate the holding fixture to put the transmission in a vertical position with the converter housing up.

2. Remove the six converter housing and front pump to case retaining bolts. Remove the converter housing from the front pump.

3. Remove the front pump by inserting a screwdriver behind the input shell (Fig. 43). Move the input shell forward until the front pump seal is above the edge of the case. Remove the front pump and gasket from the case. If the selective thrust washer No. 1 did not come out with the front pump, remove it from the top of the reverse-high clutch.

4. Remove the intermediate and low-reverse band adjusting screws from the case. Rotate the intermediate band to align the band with the clearance hole in the case (Fig. 44). Remove the intermediate band from the case. If the intermediate band is to be re-used, do not clean it in a vapor degreaser, or with a detergent solution. Clean the band with a lint free cloth.

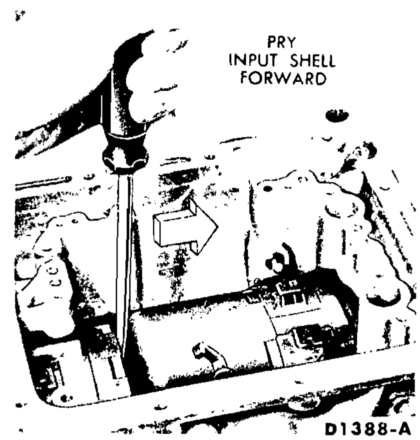


FIG. 43—Removing Front Pump

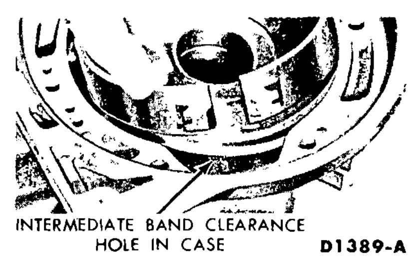


FIG. 44—Removing or Installing Intermediate Band

5. Using a screwdriver between the input shell and rear planet carrier (Fig. 45) lift the input shell upward and remove the forward part of the gear train as an assembly (Fig. 46).

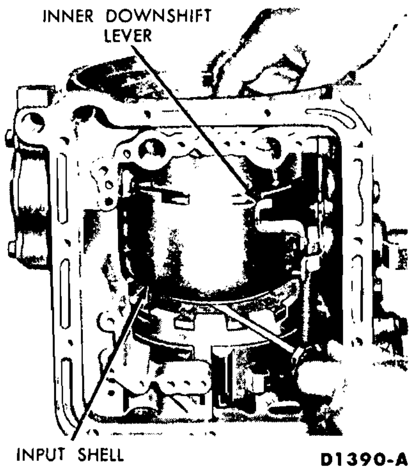


FIG. 45—Lifting Input Shell and Gear Train

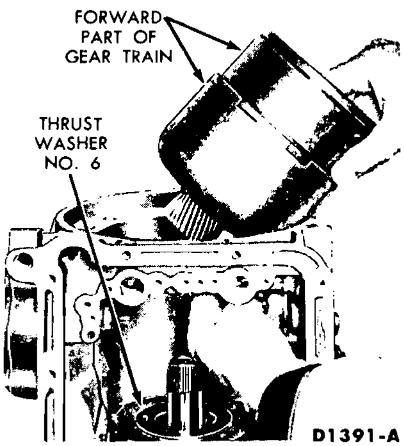


FIG. 46—Removing or Installing Forward Part of Gear Train

6. Place the forward part of the gear train in the holding fixture shown in Fig. 47.

7. From the gear train in the holding fixture, remove the reverse-high clutch and drum from the forward clutch (Fig. 48).

8. If thrust washer No. 2 (Fig. 41) did not come out with the front pump, remove the thrust washer from the forward clutch cylinder. Remove the forward clutch from the forward clutch hub and ring gear (Fig. 48).

9. If thrust washer No. 3 (Fig. 47) did not come out with the forward clutch, remove the thrust washer from the forward clutch hub.

10. Remove the forward clutch hub and ring gear from the front planet carrier (Fig. 48).

11. Remove thrust washer No. 4 and the front planet carrier from the input shell.

12. Remove the input shell, sun gear and thrust washer No. 5 from the holding fixture (Fig. 48).

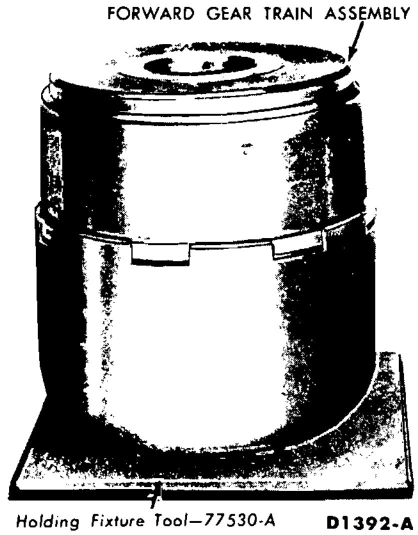


FIG. 47—Forward Part of Gear Train Positioned in Holding Fixture

13. From inside the transmission case, remove thrust washer No. 6 (Fig. 49) from the top of the reverse planet carrier.

14. Remove the reverse planet carrier and thrust washer No. 7 from the reverse ring gear and hub (Fig. 49).

15. Move the output shaft forward and with the tool shown in Fig. 50 remove the reverse ring gear hub to output shaft retaining ring.

16. Remove the reverse ring gear and hub from the output shaft. Remove thrust washer No. 8 from the low and reverse drum.

17. Remove the low-reverse band from the case (Fig. 51).

18. Remove the low-reverse drum from the one-way clutch inner race (Fig. 49).

19. Remove the one-way clutch inner race by rotating the race clockwise as it is removed.

20. Remove the 12 one-way clutch rollers, springs, and the spring retainer from the outer race (Fig. 49). **Do not lose or damage any of the 12 springs or rollers. The outer race of the one-way clutch cannot be removed from the case until the extension housing, output shaft and governor distributor sleeve are removed.**

21. Remove the transmission from the holding fixture. Position the transmission on the bench in a vertical position with the extension housing up. Remove the four extension housing-to-case attaching bolts. Remove the extension housing and gasket from the case.

22. Pull outward on the output shaft and remove the output shaft and governor distributor assembly from the governor distributor sleeve (Fig. 52).

23. Remove the governor distributor lock ring from the output shaft (Fig. 53). Remove the governor distributor from the output shaft.

24. Remove the four distributor sleeve-to-case attaching bolts. Remove the distributor sleeve from the case. **Do not bend or distort the oil tubes as the tubes are removed from the case with the distributor sleeve.**

25. Remove the parking pawl return spring, pawl and retaining pin from the case (Fig. 54).

26. Remove the parking gear and thrust washer No. 10 from the case.

27. Remove the six one-way clutch outer race to case attaching bolts with the tool shown in Fig. 55. As the bolts are removed, hold the outer race located inside the case in position. Remove the outer race and thrust washer No. 9 from the case (Fig. 49).

PARTS REPAIR OR REPLACEMENT

During the repair of the subassemblies, certain general instructions which apply to all units of the transmissions must be followed. These instructions are given here to avoid unnecessary repetition.

Handle all transmission parts carefully to avoid nicking or burring the bearing or mating surfaces.

Lubricate all internal parts of the transmission before assembly with clean automatic transmission fluid. **Do not use any other lubricants except on gaskets and thrust washers which may be coated with vaseline to facilitate assembly.** Always install new gaskets when assembling the transmission.

Tighten all bolts and screws to the recommended torque outlined in the Specification Section.

TRANSMISSION CASE AND LINKAGE REPAIR

Low-Reverse Servo

1. Remove the four servo cover to case attaching bolts. Remove the transmission identification tag, vent tube and retaining clip from the case.

2. Remove the servo cover, cover seal, servo piston and piston return spring from the case (Fig. 56).

3. The servo piston seal is bonded to the piston. If the seal has to be replaced, replace the piston assembly which includes the seal.

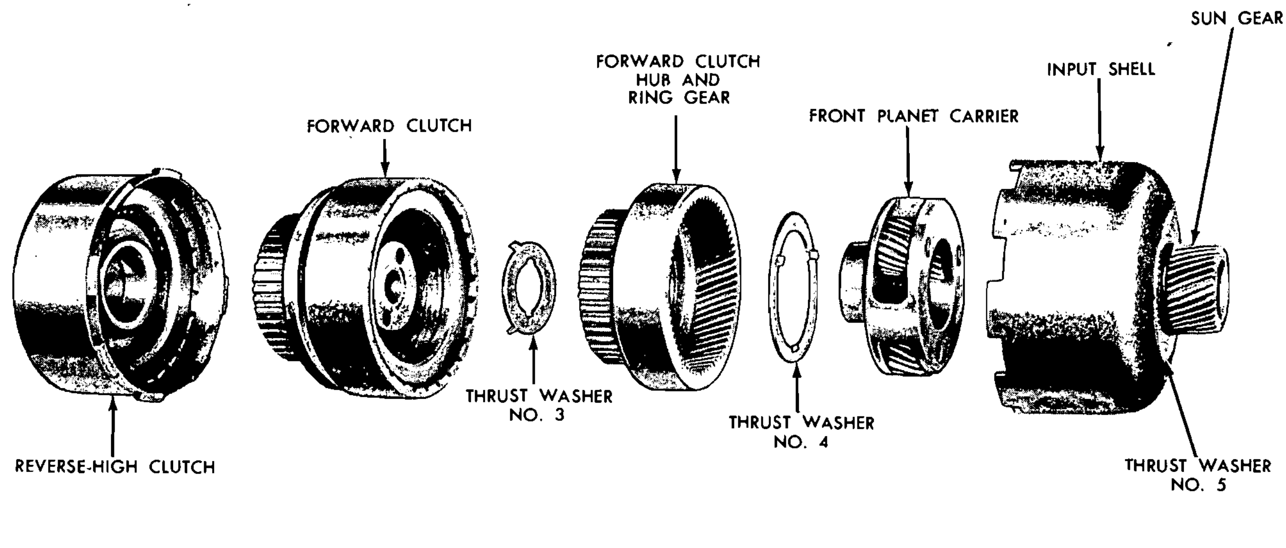


FIG. 48—Forward Part of Gear Train Disassembled

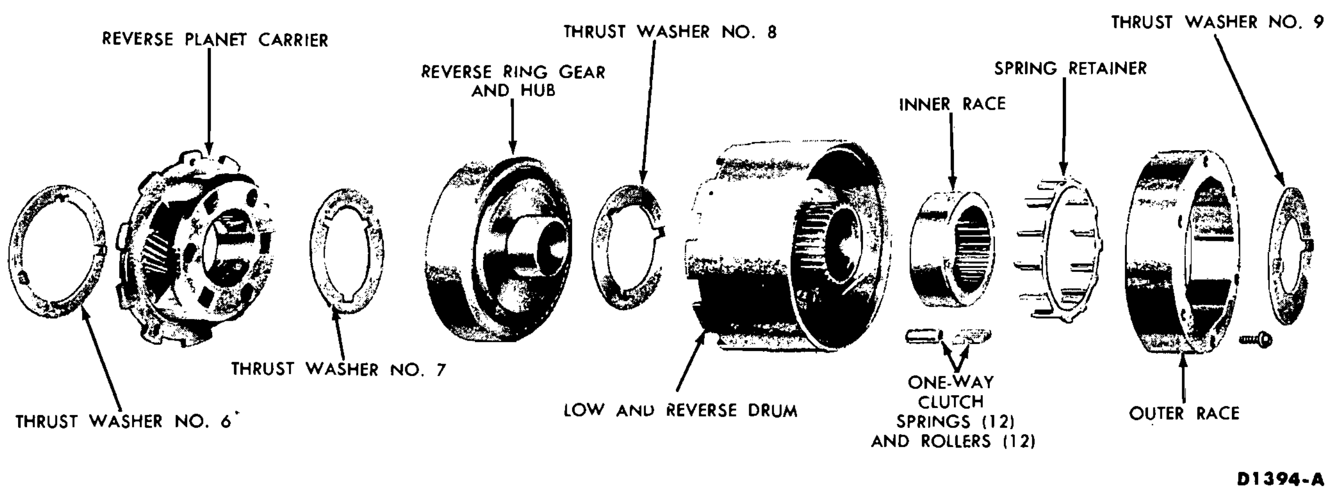


FIG. 49—Lower Part of Gear Train Disassembled

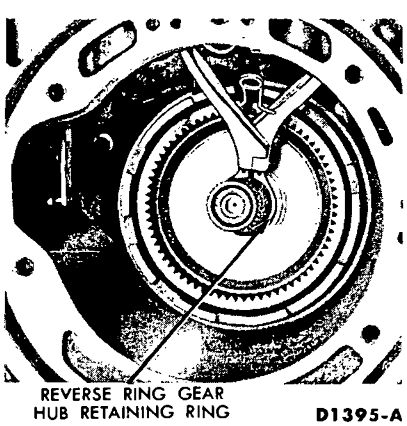


FIG. 50—Removing or Installing Reverse Ring Gear Hub Retaining Ring

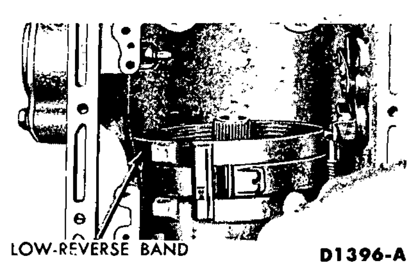


FIG. 51—Removing or Installing Low-Reverse Band

Disassemble the servo piston from the piston rod by inserting a small screwdriver in the hole of the piston rod and removing the piston attaching nut (Fig. 57). Install the new servo piston and torque the piston attaching nut to specification. Make sure the spacer and accumulator spring (Fig. 56) is positioned on the piston stem. The crowned side of the spring should face toward the rod.

4. Place the piston return spring in the servo bore of the case. Lubricate the piston seal with clean transmission fluid and install the servo piston (Fig. 56).

5. Place a new cover seal on the cover and install the servo cover. Install the identification tag and the vent tube and retaining clip. Install the four cover attaching bolts. Torque the cover to case retaining bolts to specification.

Intermediate Servo Repair

1. Remove the four servo cover-to-case attaching bolts.

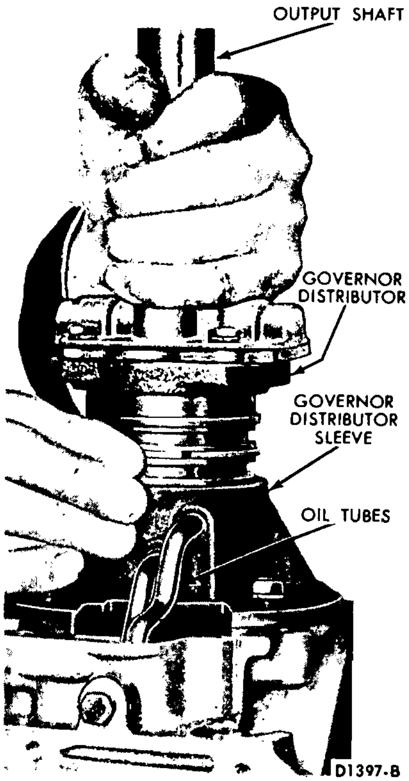


FIG. 52—Removing or Installing Output Shaft and Governor Distributor

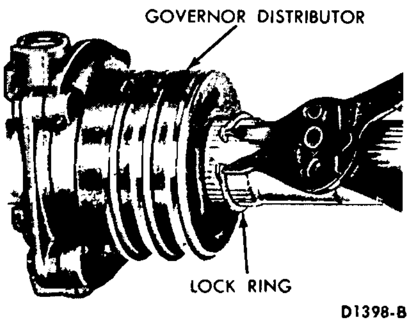


FIG. 53—Removing or Installing Governor Distributor Lock Ring

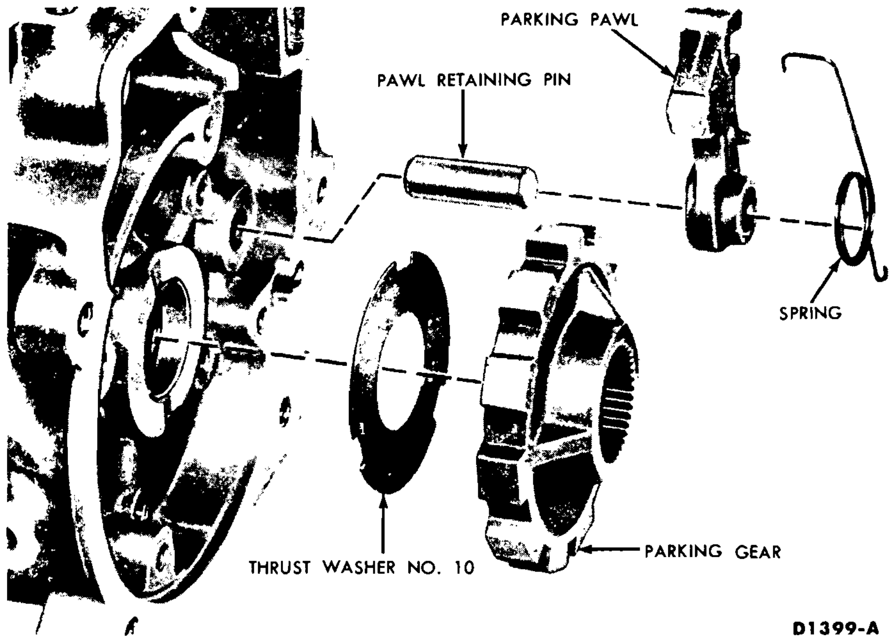


FIG. 54—Parking Pawl Mechanism

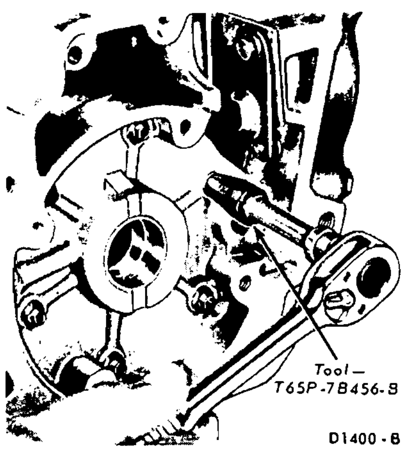


FIG. 55—Removing One-Way Clutch Outer Race Attaching Bolts

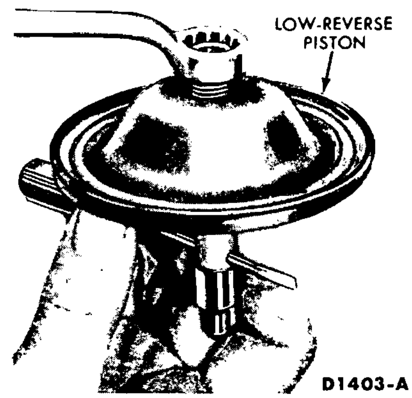


FIG. 57—Removing or Installing Low-Reverse Servo Piston

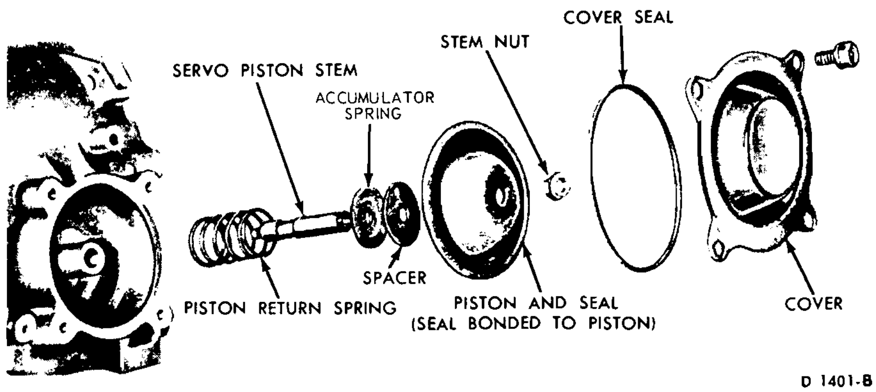


FIG. 56—Low-Reverse Servo Disassembled

2. Remove the servo cover, gasket, servo piston, and piston return spring from the case (Fig. 58).

3. On a transmission used with six cylinder engines, remove the intermediate servo piston from the cover by inserting air pressure into the pressure hole in the cover (Fig. 59).

4. Remove the seal rings from the servo piston and cover.

5. Install a new seal on the cover and servo piston. Figure 60 shows the correct servo piston and cover for each transmission model. Lubricate the seals with clean transmission oil. Install the piston into the cover. Be careful not to damage the piston seal.

6. Install the piston return spring in the servo bore of the case.

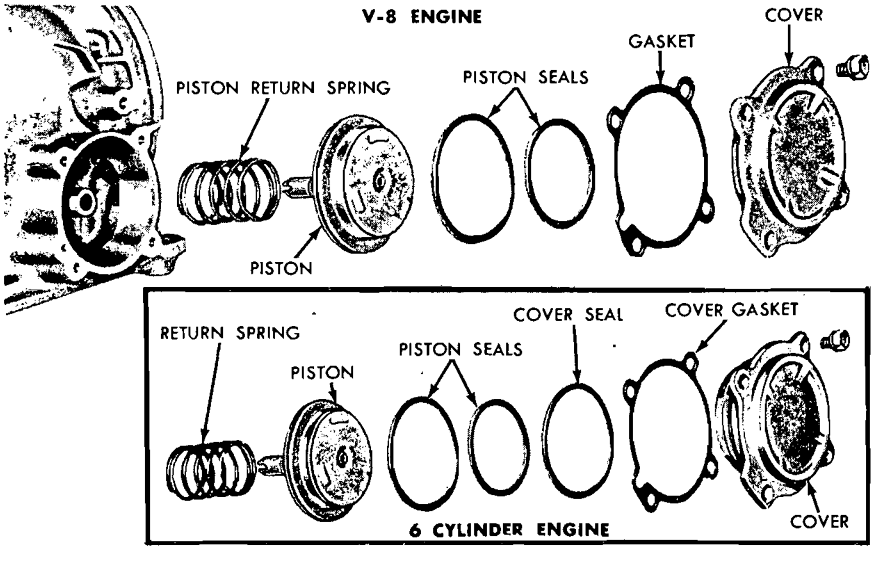


FIG. 58—Intermediate Servo Disassembled

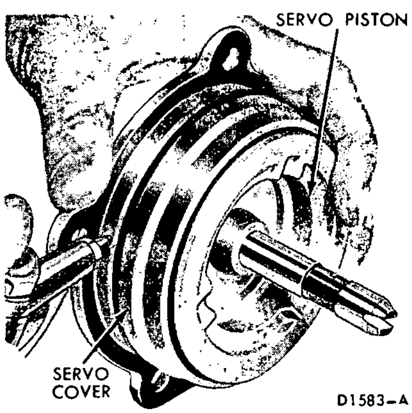
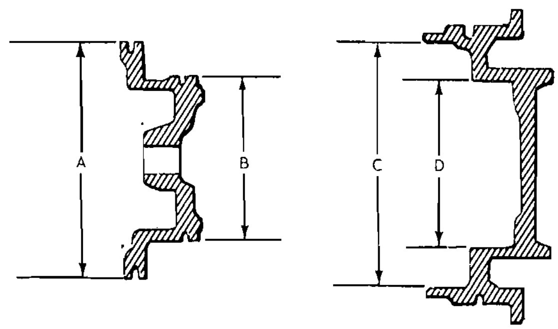


FIG. 59—Removing Intermediate Servo Piston—6 Cylinder Engine



Vehicle	Engine	Transmission	Servo Piston		Servo Cover	
			Dia. A	Dia. B	Dia. C	Dia. D
Fairlane-Comet Mustang-Cougar Falcon	289-2V 289-2V, 4V 289-2V, 4V	PEE-B, E, J PEE-C,K PEE-H	3.7875	2.8265	Not Applicable	2.840
Mustang-Falcon Fairlane	200-1V 200-1V	PEB-B,C, PEB-C,F, PEE-D	3.3265	2.4865	3.340	2.500
Falcon	170-1V	PEB-A	3.3265	2.3765	3.340	2.390

D1800-A

FIG. 60—Intermediate Servo Piston and Cover Identification

7. Place a new gasket on the servo cover. Position the servo piston and cover assembly into the case making sure that the slot is in a horizontal position to engage the strut. Use two 5/16-18 bolts, 1 1/4 inch long, 180° apart, to position the cover against the case. Install two cover attaching bolts. Remove the two 1 1/4 inch bolts and install the other two cover attaching bolts. Torque the attaching bolts to specification.

Downshift and Manual Linkage

1. Remove the downshift outer lever attaching nut. Remove the downshift outer and inner levers. Remove the neutral start switch by placing a screwdriver behind the switch and carefully prying the switch off of the lever. From inside the transmission case, remove the upper retaining ring from the manual lever link (Fig. 61). Remove the upper end of the lever link from the case retaining pin.

2. From the back of the transmission case, remove the upper retaining ring and flat washer from the parking pawl link (Fig. 62). Remove the pawl link from the case retaining pin.

3. From the back of the transmission case, remove the parking pawl link, toggle rod, and manual lever link as an assembly (Fig. 63).

4. Remove the rear parking pawl link lower retaining ring, flat washer and link from the toggle rod (Fig. 64).

5. Remove the manual lever link lower retaining ring and link from the toggle rod.

6. Remove the inner manual lever attaching nut and lever. Remove the outer manual lever from the case.

7. To remove the manual lever seal, use the tools shown in Fig. 65. To install the new seal, use the tool shown in Fig. 66.

8. Install the outer manual lever in the case. Install the inner manual lever and attaching nut (Fig. 61). Torque the nut to specification.

9. From the back of the transmission case, install the parking toggle rod and link assembly into the case (Fig. 63).

10. Install the parking pawl link on the case retaining pin. Install the flat washer and link retaining ring (Fig. 62).

11. Position the inner manual lever behind the manual lever link, with the cam of the lever contacting the lower link pin (Fig. 67).

12. Install the upper end of the manual lever link on the case retaining pin. Install the retaining ring.

13. Operate the manual lever and check for correct linkage operation.

14. Install the neutral start switch.

15. Install the inner and outer downshift levers. Torque the attaching nut to specifications.

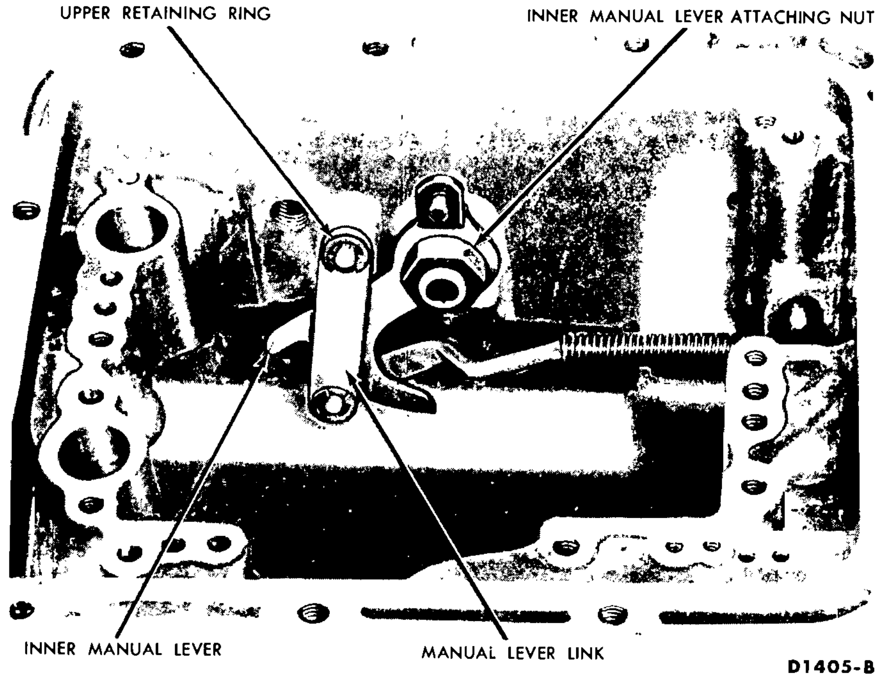


FIG. 61—Case Internal Linkage

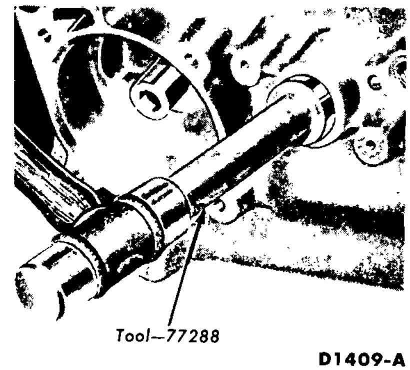


FIG. 66—Installing Manual Lever Seal

Thread Repair—Case

Thread service kits may be purchased from local jobbers or the Heli-Coil Corporation. To repair a damaged thread, the following procedures should be carefully followed.

1. Drill out the damaged threads, **using the same drill size as the thread O.D.** For example, use a 5/16- inch drill for a 5/16-18 thread.
2. Select the proper **special** tap and tap the drilled hole. The tap is marked for the size of the thread being repaired. Thus, the special tap marked 5/16-18 will not cut the same thread as a standard 5/16-18 tap. It does cut a thread large enough to accommodate the insert, and after the insert is installed the original thread size (5/16-18) is restored.
3. Select the proper coil inserting tool. These tools are marked with

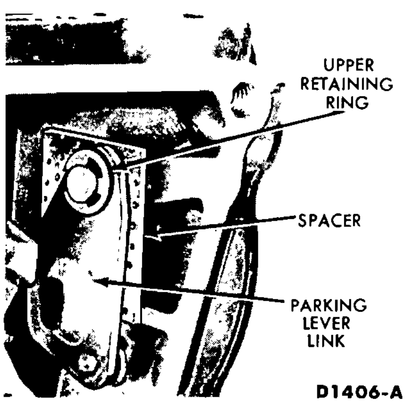


FIG. 62—Parking Pawl Link Installed

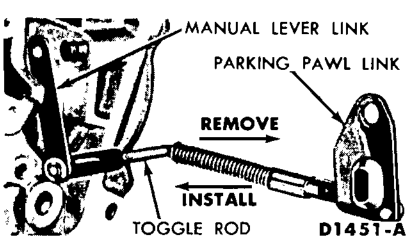


FIG. 63—Removing or Installing Parking Pawl Toggle Rod

Bushing Replacement-Case

1. If the transmission case bushing is to be replaced, press the bushing out of the case with the tool shown in Fig. 68.
2. Install a new transmission case bushing with the tool shown in Fig. 68.

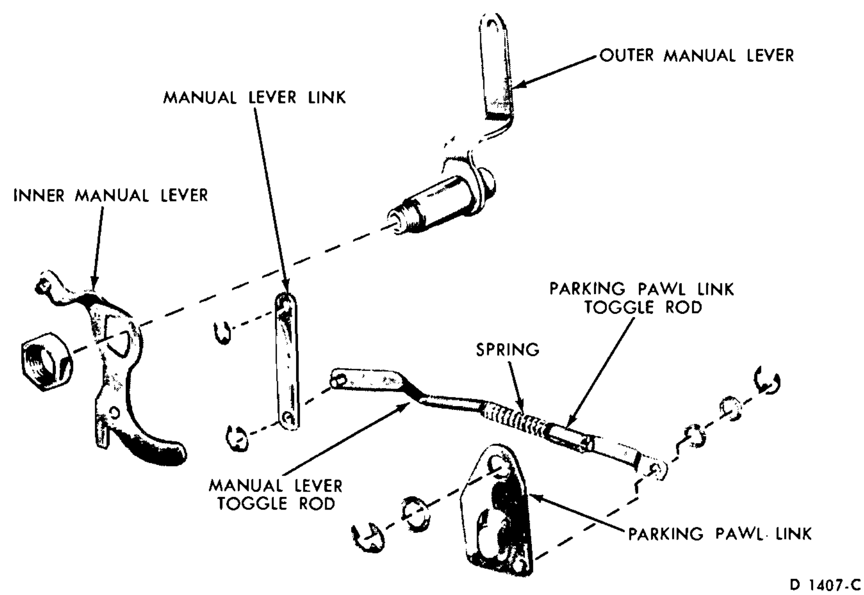


FIG. 64—Case Linkage

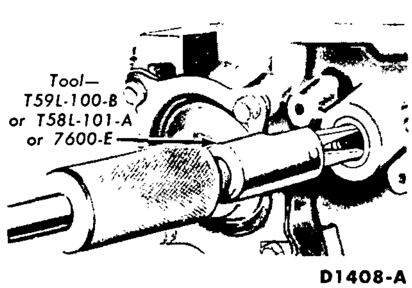


FIG. 65—Removing Manual Lever Seal

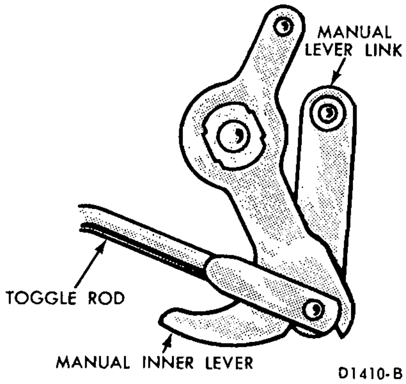


FIG. 67—Inner Manual Lever Location

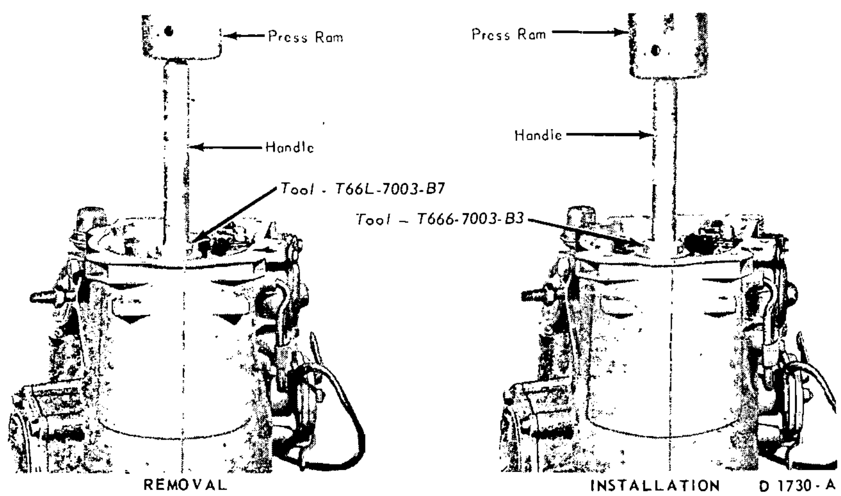


FIG. 68—Replacing Transmission Case Bushing

the thread size being repaired. Place the insert on the tool and adjust the sleeve to the length of the insert being used.

Press the insert against the face of the tapped hole. Turn the tool clockwise and wind the insert into the hole until the insert is 1/2 turn below the face.

4. Working through the insert, bend the insert tang straight up and down until it breaks off at the notch.

5. If the inserts are not properly installed, they can be removed with the extractor tool. Place the extractor tool in the insert so that the blade rests against the top coil 1/4 to 1/2 turn away from the end of the coil. Tap the tool sharply with a hammer so that the blade cuts into the insert. Exert downward pressure on the tool and turn it counterclockwise until the insert is removed.

CONTROL VALVE

Disassembly

1. Remove the screws that attach the oil screen to the body and remove the screen (Fig. 69).

2. Remove the lower valve body attaching screws and separate the lower valve body, separator plate, gasket and hold-down plates (Fig. 70) from the upper valve body. Be careful not to lose the check valves and spring when separating the upper and lower valve bodies.

3. Depress the manual valve detent spring with the tool shown in Fig. 71. Remove the spring retaining pin (roll pin) from the upper valve body. Remove the spring and detent plunger.

4. Slide the manual valve out of the body.

5. Remove the cut-back and the back-out valve cover plate from the valve body (Fig. 72).

6. Remove the cut-back valve from the body.

7. Remove the 2-3 back-out valve, spring and the manual low valve from the body.

8. Remove the 1-2 shift valve and the 2-3 shift valve cover plate from the valve body.

9. Remove the 2-3 shift valve and the throttle modulator valve and spring from the body.

10. Remove the 1-2 shift valve, D2 valve and the spring from the body.

11. Remove the intermediate band accumulator valve cover plate from the valve body.

12. Remove the intermediate accumulator sleeve, 3-2 control valve, spring, and the intermediate servo accumulator valve.

13. Remove the pressure booster valve cover plate (Fig. 72).

14. Remove the pressure booster valve and sleeve, washer, springs and the main regulator valve.

15. Remove the spring and the line pressure coasting boost valve (Fig. 72).

16. Carefully pry the downshift valve retainer from the body, then remove the spring and valve.

17. Depress the throttle booster valve plug (Fig. 73) to release the retaining pin. Remove the plug, valve and the spring.

18. Remove the two hold-down plates and the separator plate from the lower valve body. Be careful not to lose the check valve when removing the separator plate and gasket from the lower valve body.

Assembly

1. Place the check valve in the lower body as shown in Fig. 70. Posi-

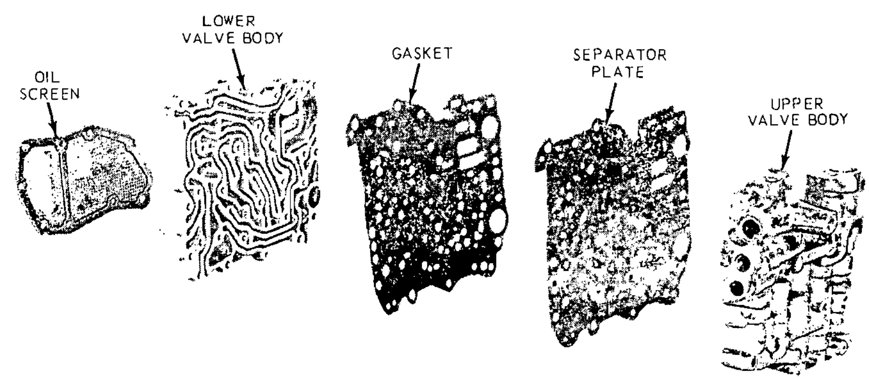


FIG. 69—Upper and Lower Valve Bodies Disassembled

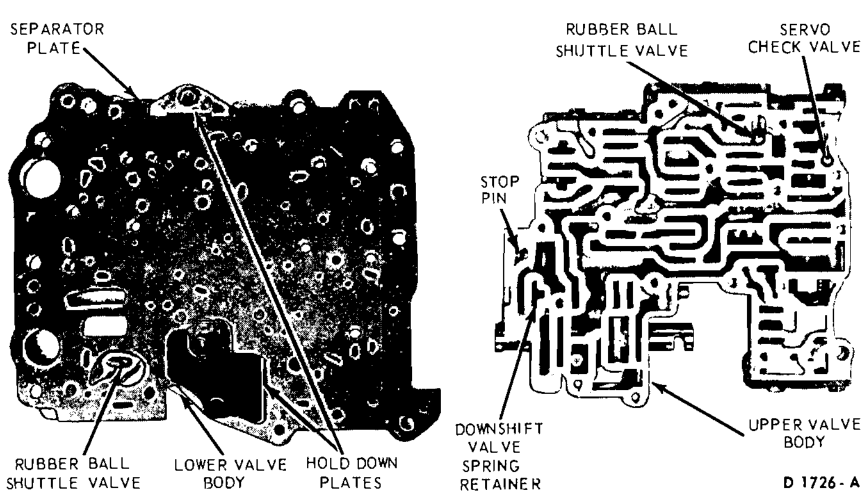


FIG. 70—Separating Upper and Lower Valve Bodies

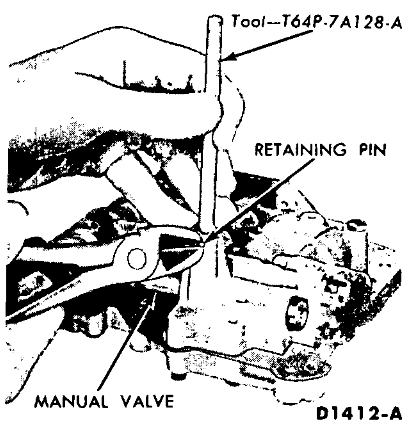


FIG. 71—Removing Manual Valve

tion the separator plate and the two hold-down plates on the lower valve body and install the four attaching screws and torque them to specification.

2. Place the throttle booster valve spring, valve (long end into spring) and the plug (Fig. 72). Depress the plug and install the retaining pin.

3. Insert the downshift valve into the body with the large diameter facing inward. Install the downshift valve spring and the retainer (Fig. 72).

4. Insert the line pressure coasting boost valve and spring in the body (Fig. 72).

5. Place the main regulator valve in the body with the large diameter facing inward. Install the two springs and the spacer, pressure booster valve and sleeve.

6. Hold the pressure booster valve cover plate in place and install the three attaching screws and torque them to specification.

7. Place the intermediate servo accumulator valve and spring in the body. Install the intermediate accumulator sleeve and 3-2 control valve. Secure the cover to the body with the attaching screw. Torque the screw to specifications.

8. Position the spring, D2 valve and the 1-2 shift valve in the body.

9. Place the throttle modulator valve, spring, and 2-3 shift valve in the body.

10. Secure the 1-2 shift valve and the 2-3 valve cover plate to the body and torque the screws to specifications.

11. Place the manual low valve, spring, and the 2-3 back-out valve in the body.

12. Place the cut-back valve in the body.

13. Secure the cut-back and the back-out cover plate to the body with two screws. Torque the screws to specifications.

14. Slide the manual valve into the body making sure that the notch for the manual lever is toward the inside and that the detent notches are facing upward.

15. Place the detent plunger and spring in the body. Depress the spring and install a new roll pin.

16. Position a new rubber check valve in the upper valve body (Fig. 70).

17. Position the check valve and spring in the upper valve body (Fig. 70). Place a new gasket, separator plate and the lower valve body in place on the upper valve body and secure them with the attaching screws. Torque the screws to specifications.

18. Secure the oil screen to the body with the attaching screws. Torque the screws to specifications.

FRONT PUMP

1. Remove the four seal rings from the stator support and the O-ring seal from the pump housing.

2. Remove the five bolts that attach the stator support to the front pump housing. Remove the stator support from the pump housing (Fig. 74).

3. Remove the front and rear stator support bushings if they are worn or damaged. Use the cape chisel (Fig. 75) and cut along the bushing seam until the chisel breaks through the bushing wall. Pry the loose ends of the bushing up with an awl and remove the bushing.

4. Remove the drive and driven gears from the front pump housing.

5. If the front pump housing bushing is worn or damaged, press the bushing from the housing as shown in Fig. 76.

6. Press a new bushing into the pump housing with the handle and tool shown in Fig. 76. Make sure the bushing is installed with the slot and groove positioned to the rear of the pump body and 60° below the horizontal center line.

7. Install the drive and driven gears in the pump housing. Each gear has an identification mark on the side of the gear teeth that are chamfered. **The chamfered side with the identification mark has to be positioned downward against the face of the pump housing.**

8. Press new bushings into the stator support with the tool shown in Fig. 77. Use the end with the 1/8 inch step for the front bushing and the end with the 1/4 inch step for the rear bushing. When installing the rear bushing, be sure the hole in the bushing is lined up with the lube hole in the stator support.

9. Place the stator support in the pump housing and install the five attaching bolts. Torque the bolts to specifications.

10. Install the four seal rings on the stator support. Two large rings are assembled first in the ring grooves toward the front of the stator support. Install the O-ring seal on the pump housing (Fig. 74).

11. Check the pump gears for free rotation by placing the pump on the converter drive hub in its normal running position and turning the pump housing.

12. If the front pump seal must be replaced, mount the pump in the transmission case and remove the seal with the tool shown in Fig. 78. To install the new seal use the tool shown in Fig. 78.

REVERSE-HIGH CLUTCH

1. Remove the pressure clutch

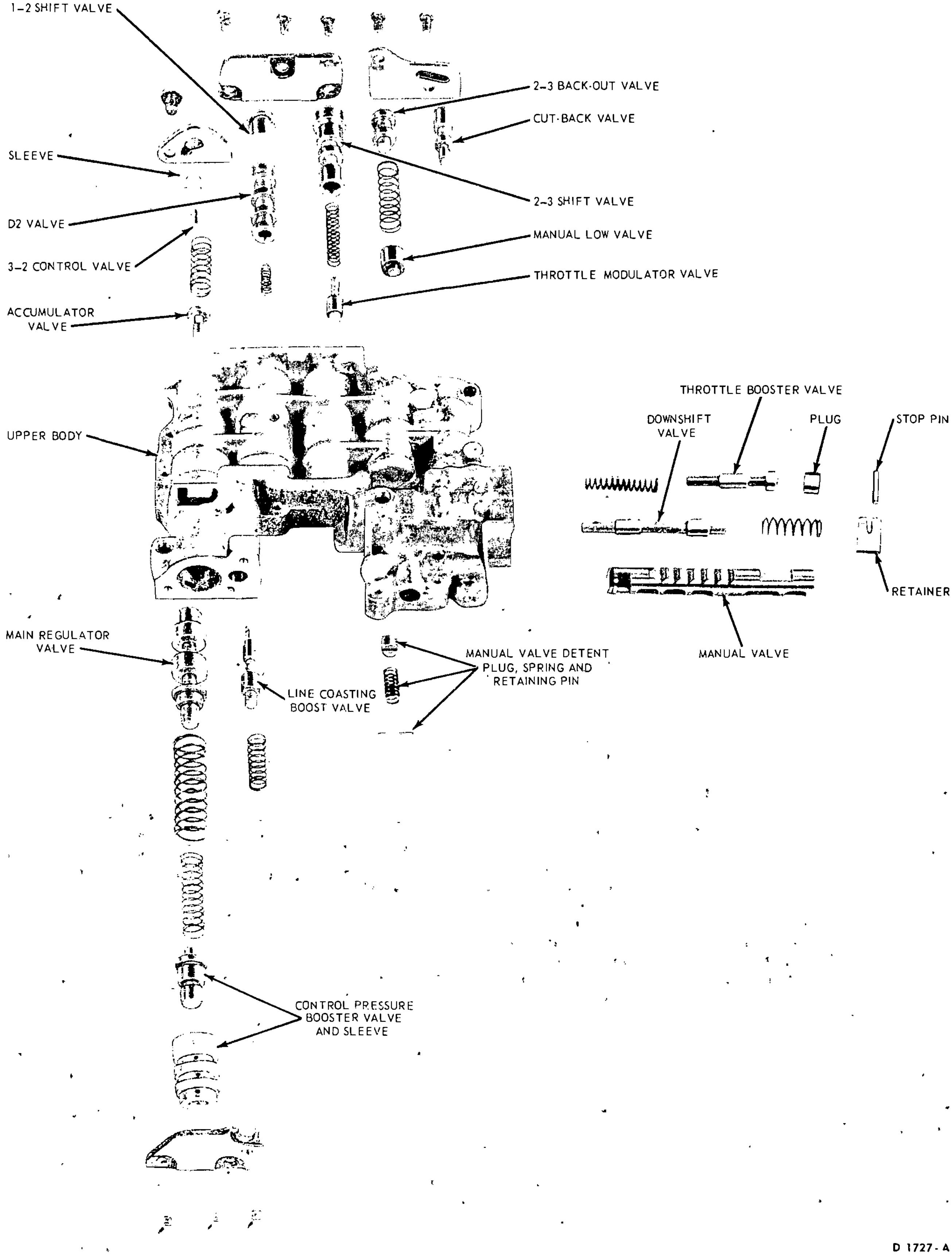


FIG. 72—Upper Valve Body Disassembled

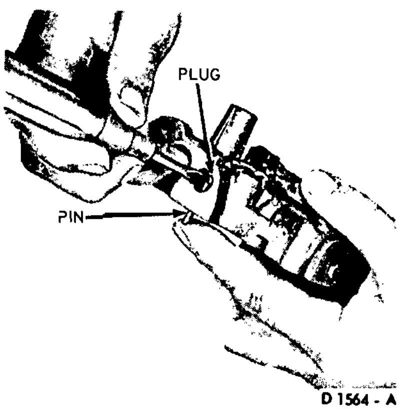


FIG. 73—Removing Throttle Booster Valve

with a detergent solution. Wipe the plates clean with lint-free cloth.

3. To remove the piston spring retainer snap ring, place the clutch hub in the arbor press. With the tools shown in Fig. 82, compress the piston return springs and remove the snap ring. When the arbor press ram is released, guide the spring retainer to clear the snap ring groove of the drum.

4. Remove the spring retainer and ten piston return springs.

5. Remove the piston by inserting air pressure in the piston apply hole of the clutch hub (Fig. 83).

6. Remove the piston outer seal

downward, make sure the spring retainer is centered to clear the drum. Install the snap ring. **Before the press ram is released make sure the snap ring is positioned inside of the four snap ring guides on the spring retainer.**

11. When new composition clutch plates are used, soak the plates in transmission oil for fifteen minutes before the plates are assembled. Install the clutch plates alternately by starting first with a steel plate then a non-metallic plate (Fig. 81). The last plate installed is the pressure plate. For the correct number of clutch plates required for each transmission model, refer to Part 7-4.

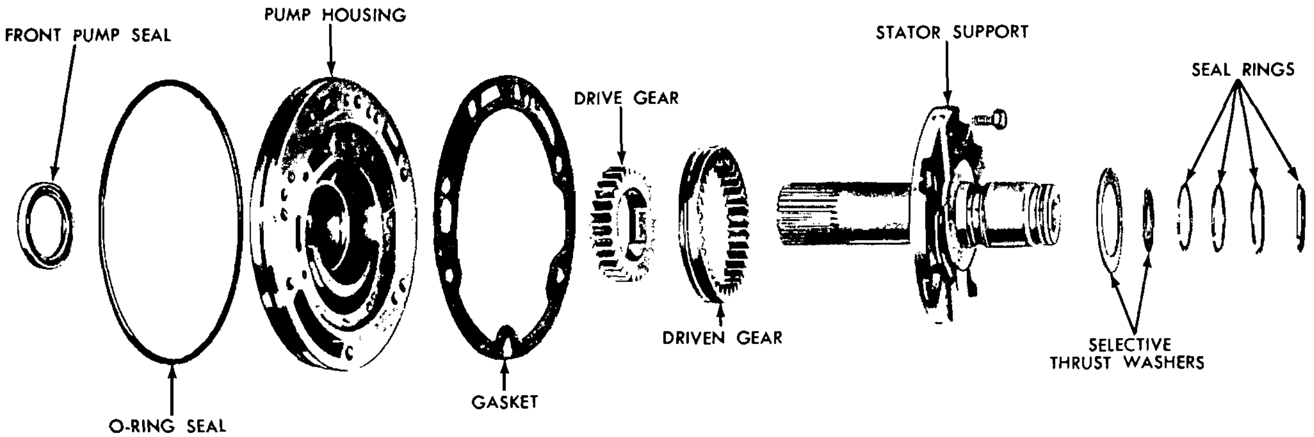


FIG. 74—Front Pump and Stator Support Disassembled

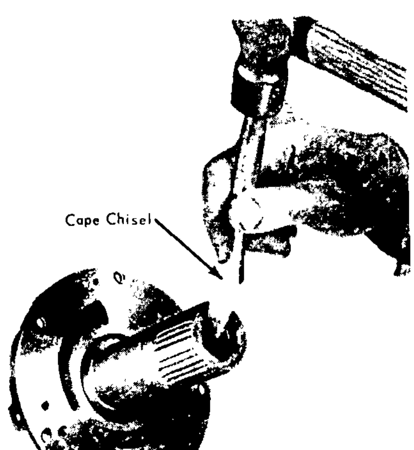


FIG. 75—Removing Stator Support Bushings

plate retaining snap ring (Fig. 80).

2. Remove the pressure plate, and the drive and driven clutch plates. (Fig. 81). If the composition clutch plates are to be reused, do not clean the plates in a vapor degreaser or

from the piston and the piston inner seal from the clutch drum.

7. Remove the drum bushing if it is worn or damaged. Use the cape chisel (Fig. 84) and cut a shallow groove 3/4 inch in length along the bushing seam until the chisel breaks through the bushing wall. Pry the loose ends of the bushing up with an awl and remove the bushing. To prevent leakage at the stator support O-rings, be careful not to nick or damage the hub surface with the chisel.

8. Position the drum in a press, and press a new bushing into the drum with the handle and tool shown in Fig. 85.

9. Install a new inner seal in the clutch drum and a new outer seal on the clutch piston. Lubricate the seals with clean transmission fluid and install the piston into the clutch drum.

10. Place the ten clutch piston springs into position on the clutch piston. Place the spring retainer on top of the springs. To install the snap ring, use the tools shown in Fig. 82. As the press ram is moved

12. Install the pressure plate retaining snap ring (Fig. 80). Make sure the snap ring is fully seated in the snap ring groove of the clutch hub.

13. With a feeler gauge, check the clearance between the snap ring and the pressure plate (Fig. 86).

14. The pressure plate should be held downward as the clearance is checked. The clearance should be 0.050-0.066 inch. If the clearance is not within specifications, selective thickness snap rings are available in these thicknesses, 0.102-0.106, 0.088-0.092, 0.074-0.078, and 0.060-0.064 inch. Install the correct size snap ring and recheck the clearance.

FORWARD CLUTCH

1. Remove the clutch pressure plate retaining snap ring (Fig. 87).

2. Remove the pressure plate, and the drive and driven clutch plates from the clutch hub (Fig. 88).

3. Remove the disc spring retaining snap ring (Fig. 89).

4. Apply air pressure at the clutch piston pressure hole (Fig. 90), to

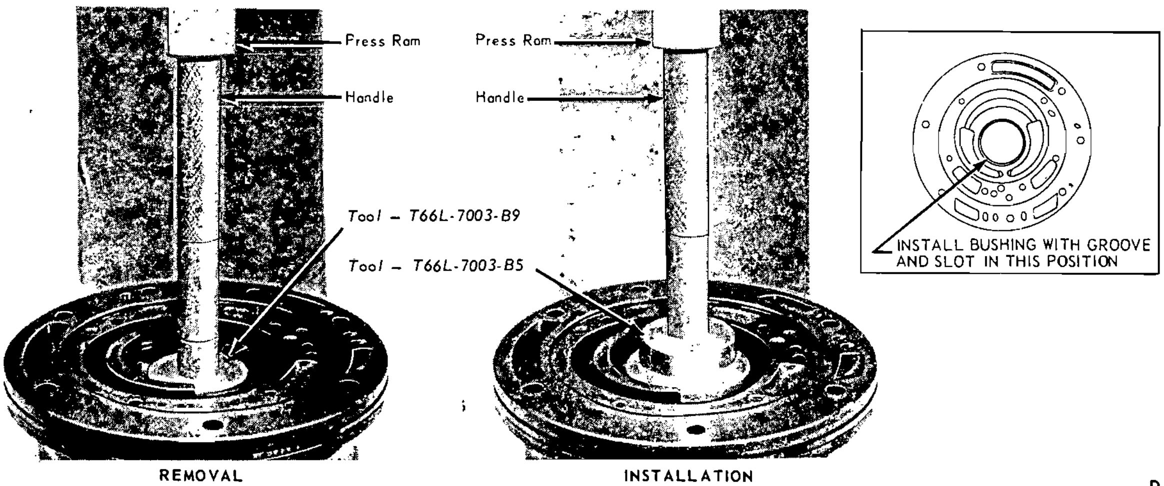


FIG. 76—Removing Front Pump Housing Bushing

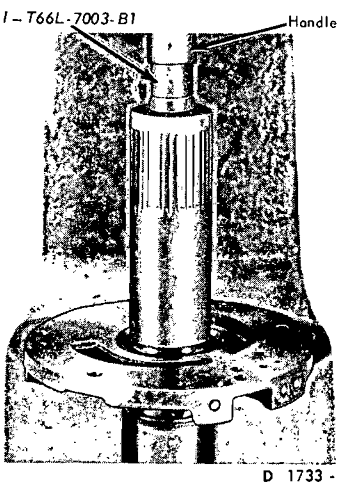


FIG. 77—Installing Stator Support Bushings

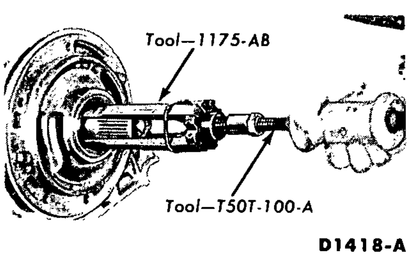


FIG. 78—Removing Front Pump Seal

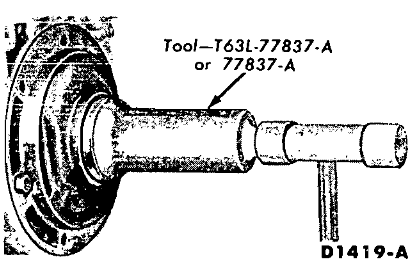


FIG. 79—Installing Front Pump Seal

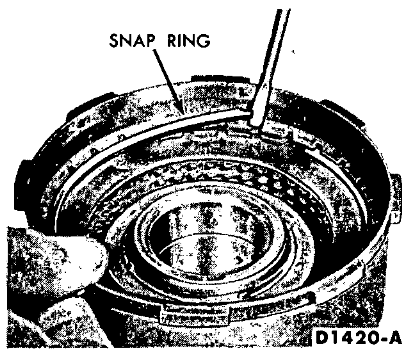


FIG. 80—Removing Reverse-High Clutch Snap Ring

remove the piston from the clutch hub.

5. Remove the clutch piston outer seal and the inner seal from the clutch hub (Fig. 88).

6. Install new clutch piston seals on the clutch piston and drum. Lubricate the seals with clean transmission fluid.

7. Install the clutch piston into the clutch hub. Install the steel ring on the piston. Install the disc spring and retaining snap ring (Fig. 89).

8. Install the lower pressure plate with the flat side up and radius side downward.

Install one non-metallic clutch plate and alternately install the drive and driven plates. The last plate installed will be the top pressure plate. (Fig. 88). Refer to Specification Section for the correct number of clutch plates for the applicable model transmission.

9. Install the pressure plate retaining snap ring (Fig. 87). Make sure the snap ring is fully seated in the ring groove of the clutch hub.

10. With a feeler gauge, check the clearance between the snap ring and the pressure plate (Fig. 91). Downward pressure on the plate should be used when making this check. The clearance should be 0.020-0.036 inch for transmissions having four internal splined clutch plates and 0.026-0.042 inch for transmissions having five internal splined clutch plates.

11. If the clearance is not within specifications, selective snap rings are available in these thicknesses, 0.102-0.106, 0.088-0.092, 0.074-0.078 and 0.060-0.064 inch. Insert the correct size snap ring and recheck the clearance.

FORWARD CLUTCH HUB AND RING GEAR

1. Remove the forward clutch hub retaining snap ring (Fig. 92).

2. Remove the forward clutch hub from the ring gear.

3. If the clutch hub bushing is worn or damaged, press the bushing from the hub as shown in Fig. 93.

4. Install a new bushing into the clutch hub as shown in Fig. 93.

5. Install the forward clutch hub in the ring gear. Make sure the hub is bottomed in the groove of the ring gear.

6. Install the front clutch hub retaining snap ring. Make sure the snap ring is fully seated in the snap ring groove of the ring gear.

INPUT SHELL AND SUN GEAR

1. Remove the external snap ring from the sun gear (Fig. 94).

2. Remove thrust washer No. 5 from the input shell and sun gear (Fig. 95).

3. From inside the input shell, remove the sun gear. Remove the internal snap ring from the sun gear.

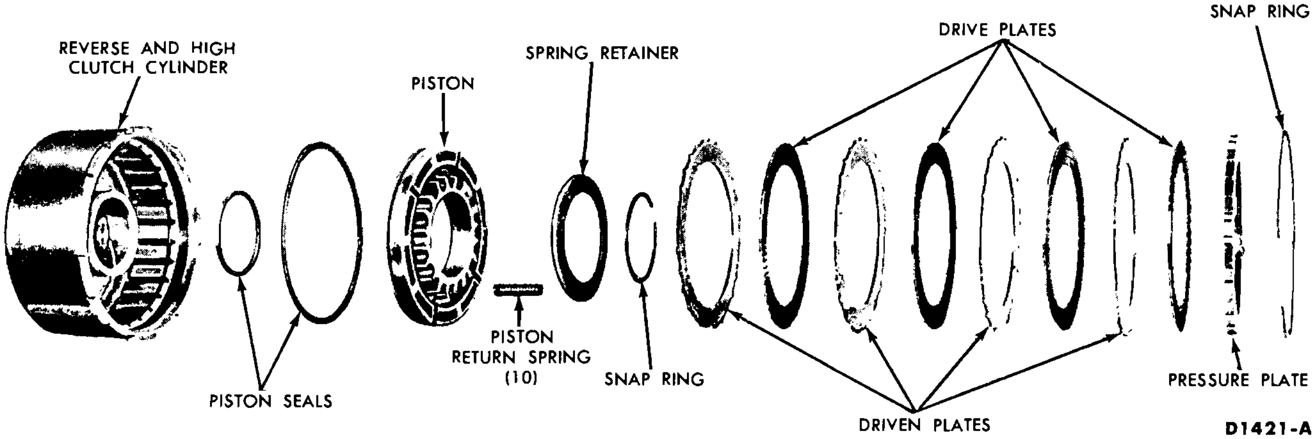


FIG. 81—Reverse-High Clutch Disassembled

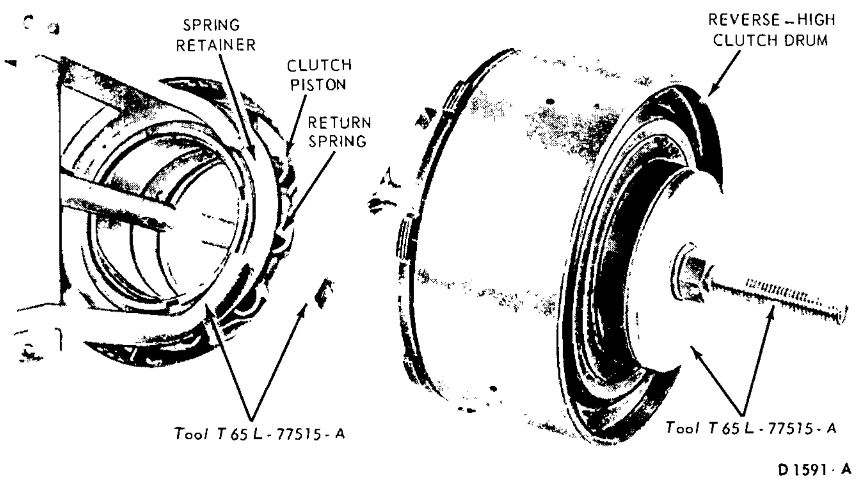


FIG. 82—Removing or Installing Clutch Piston Spring Retainer Snap Ring

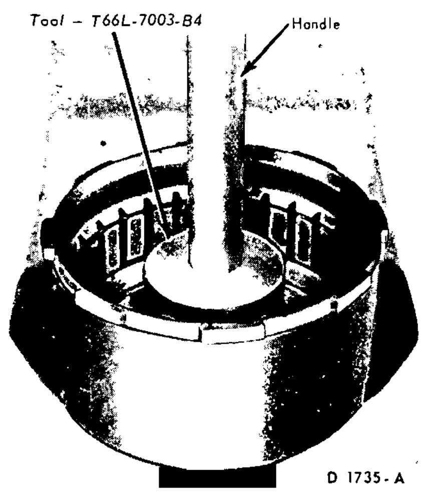


FIG. 85—Installing Reverse-High Clutch Bushing

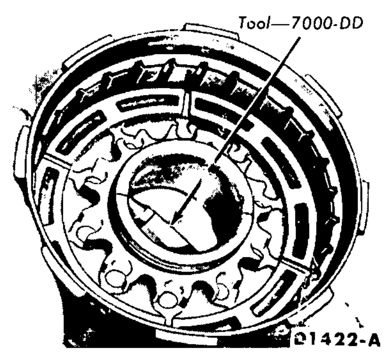


FIG. 83—Removing Reverse-High Clutch Piston

FIG. 84—Removing Reverse-High Clutch Bushing

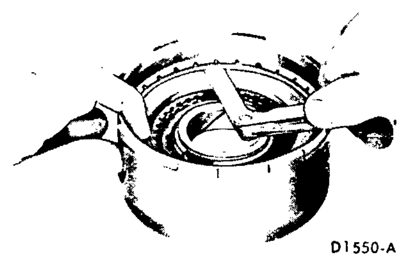


FIG. 86—Checking Reverse-High Clutch Snap Ring Clearance

4. If the sun gear bushings are to be replaced, use the tool shown in Fig. 96 and press both bushings through the gear.

5. Press a new bushing into each end of the sun gear with the tool shown in Fig. 96.

6. Install the internal snap ring on the sun gear. Install the sun gear in the input shell.

7. Install thrust washer No. 5 on the sun gear and input shell (Fig. 95).

8. Install the external snap ring on the sun gear (Fig. 94).

REVERSE RING GEAR AND HUB

1. Remove the hub retaining snap ring from the reverse ring gear.

2. Remove the hub from the reverse ring gear (Fig. 97).

3. Install the hub in the reverse ring gear. Make sure the hub is fully seated in the groove of the ring gear.

4. Install the snap ring in the reverse ring gear. Make sure the snap

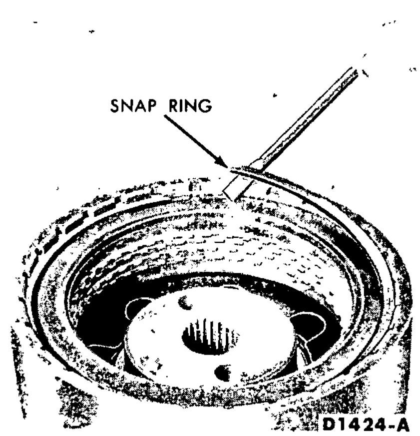


FIG. 87—Removing Forward Clutch Pressure Plate Snap Ring

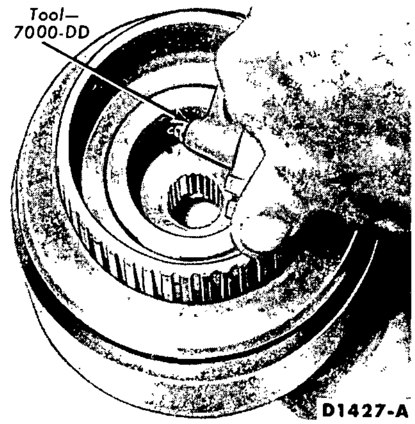


FIG. 90—Removing Forward Clutch Piston

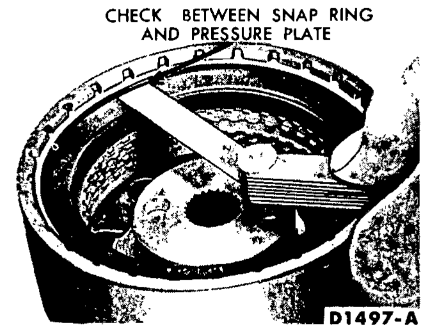


FIG. 91—Checking Forward Clutch Snap Ring Clearance

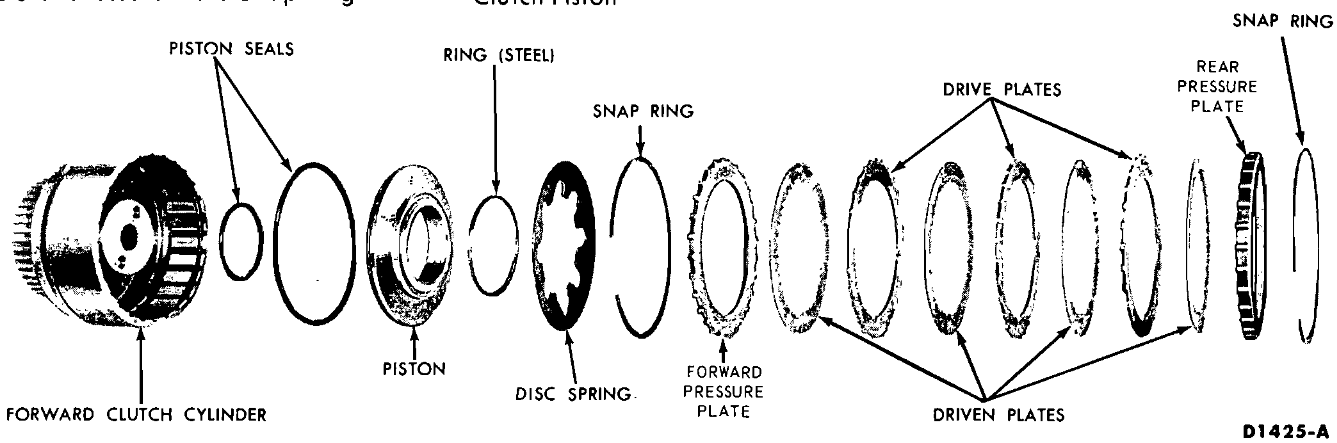


FIG. 88—Forward Clutch Disassembled

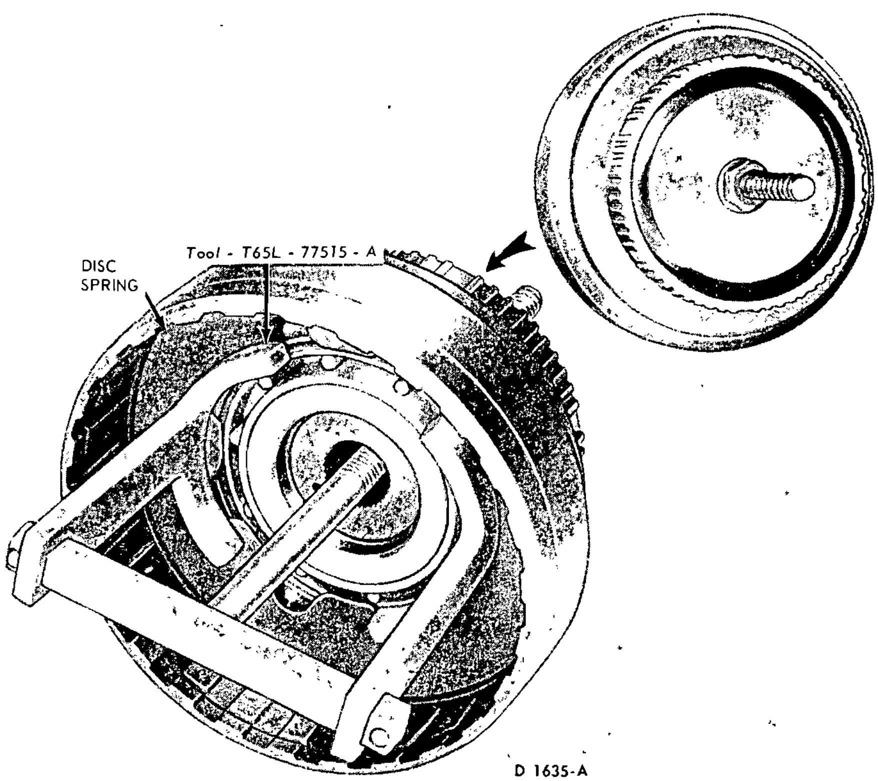


FIG. 89—Removing or Installing Disc Spring Snap Ring

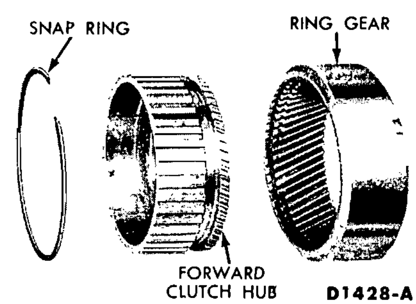


FIG. 92—Forward Clutch Hub and Ring Gear Disassembled

ring is fully seated in the snap ring groove of the ring gear.

LOW AND REVERSE BRAKE DRUM

1. Replace the low and reverse brake drum bushing if it is worn or damaged. To remove the bushing, use the cape chisel and cut along the bushing seam until the chisel breaks through the bushing wall. Pry the loose ends of the bushing up with an awl and remove the bushing.

2. Install a new bushing with the tool shown in Fig. 98.

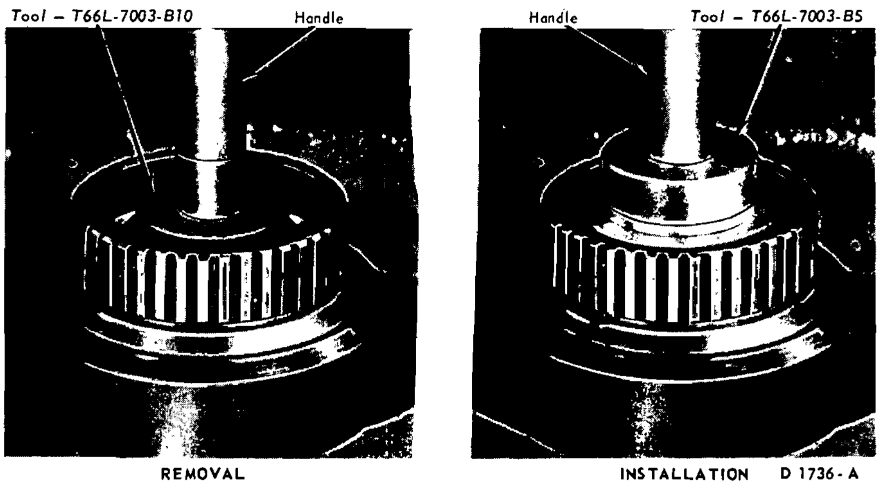


FIG. 93—Replacing Forward Clutch Hub Bushing

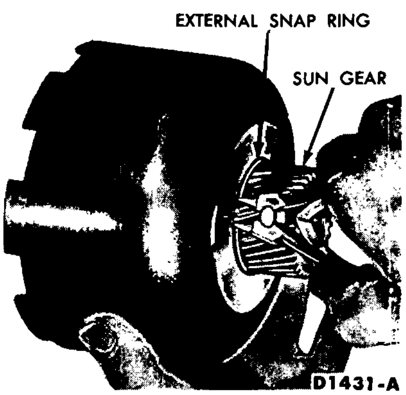


FIG. 94—Removing or Installing Sun Gear External Snap Ring

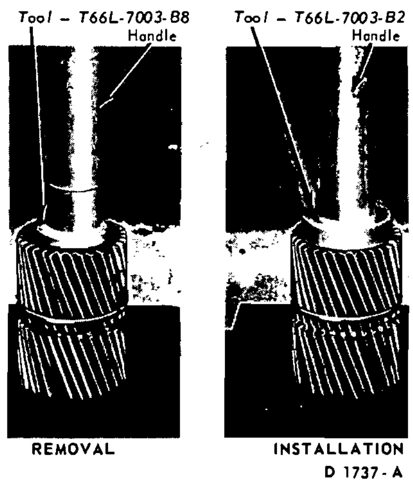


FIG. 96—Replacing Sun Gear Bushing

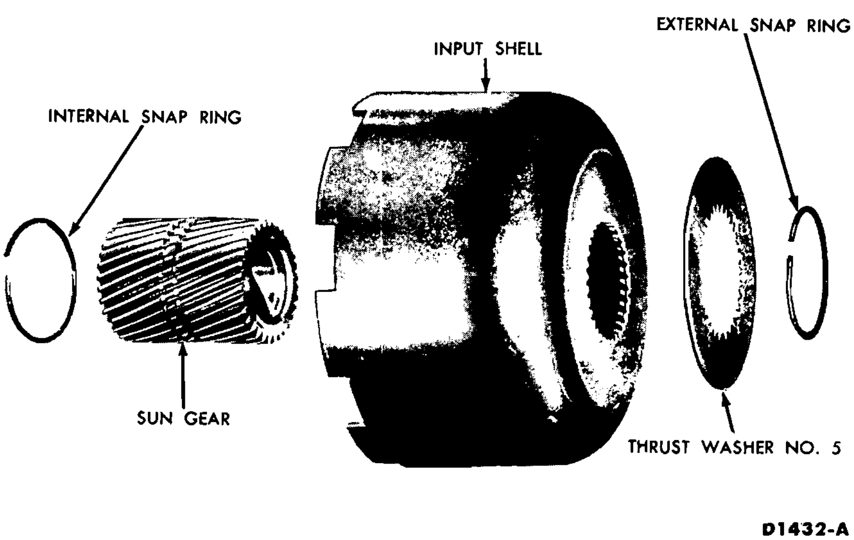


FIG. 95—Input Shell and Sun Gear Disassembled

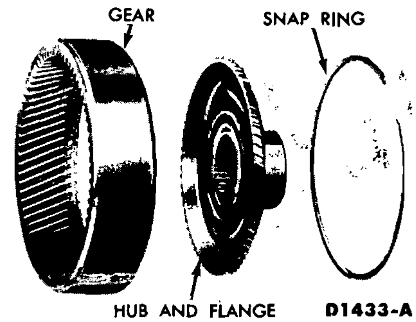


FIG. 97—Reverse Ring Gear and Hub Disassembled

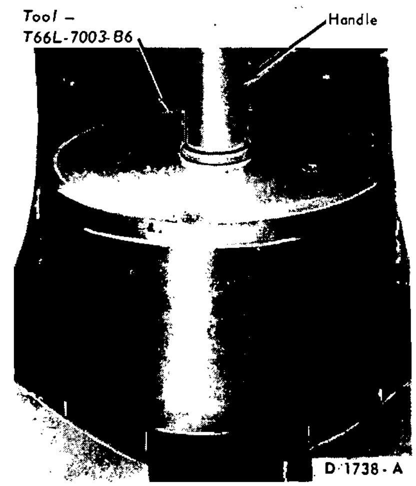


FIG. 98—Installing Low and Reverse Brake Drum Bushing

GOVERNOR AND OIL DISTRIBUTOR

1. Remove the rings from the governor oil distributor (Fig. 99).

2. Remove the governor housing to distributor attaching bolts. Remove the governor from the oil distributor. Remove the governor oil screen.

3. Remove the primary governor valve retaining ring (Fig. 100). Remove the washer, spring, and primary governor valve from the housing.

4. Remove the secondary governor valve spring retaining clip, spring, and governor valve from the housing.

5. Install the secondary governor valve in the housing. Install the spring and retaining clip. **Make sure the clip is installed with the small concaved area facing downward, to hold the spring in the correct position.**

6. Install the primary governor valve in the housing. Install the

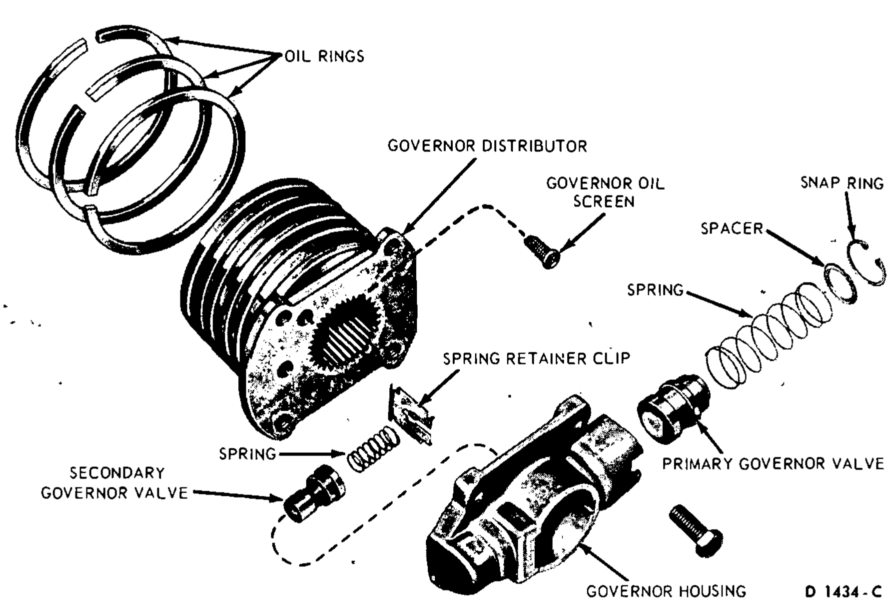


FIG. 99—Governor and Oil Distributor

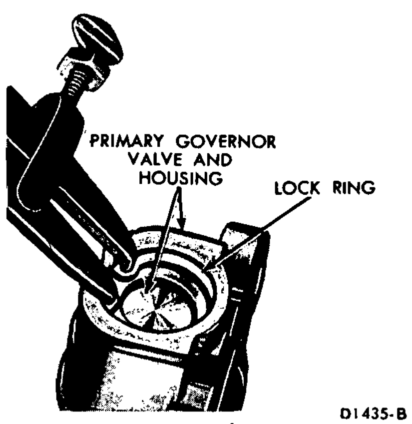


FIG. 100—Removing or Installing Retaining Ring

spring, washer and retaining ring. **Make sure the washer is centered in the housing on top of the spring and the retaining ring is fully seated in the ring groove of the housing.**

7. Install the governor oil screen.

8. Install the governor assembly on the oil distributor and torque the attaching bolts to specification.

9. Install the rings on the distributor. Check the rings for free rotation in the ring grooves of the oil distributor.

ASSEMBLY OF TRANSMISSION

When assembling the transmission sub-assemblies (Fig. 101), make sure that the correct thrust washer is used between certain sub-assemblies. Vaseline should be used to hold the thrust washers in their proper location. Lubricate thrust washers, bushings and journal with automatic transmission fluid. If the end play is not within specifications, after the transmission is assembled, either the wrong selective thrust washers were used, or a thrust washer came out of position during the transmission assembly operation.

1. Install thrust washer No. 9 inside the transmission case (Fig. 102).

2. Place the one-way clutch outer race inside the case. From the back of the case install the six outer race to case attaching bolts. **Torque the bolts to specification with the tools shown in Fig. 103.**

3. Place the transmission case in a vertical position with the back face of the case upward. Install the parking pawl retaining pin in the case (Fig. 104).

4. Install the parking pawl on the case retaining pin. Install the parking pawl return spring as shown in Fig. 104.

5. Install thrust washer No. 10 on the parking pawl gear (Fig. 105). Place the gear and thrust washer on the back face of the case (Fig. 104).

6. Place the two fluid distributor tubes in the governor distributor sleeve. Install the distributor sleeve on the case. As the distributor sleeve is installed, the tubes have to be inserted in the two holes in the case and the parking pawl retaining pin has to be inserted in the alignment hole in the distributor sleeve.

7. Install the four governor distributor sleeve-to-case attaching bolts and torque the bolts to specification.

8. Install the governor distributor assembly on the output shaft. Install the distributor retaining snap ring. Fig. 106 shows the correct snap ring that is to be used.

9. Check the rings in the governor distributor, making sure that they are fully inserted in the grooves and will rotate freely. Install the output shaft and governor distributor assembly in the distributor sleeve (Fig. 52).

10. Place a new extension housing gasket on the case. Install the extension housing, vacuum tube clip, and the extension housing-to-case attaching bolts. Torque the bolts to specification.

11. Place the transmission in the holding fixture with the front pump mounting face of the case up. **Make sure thrust washer No. 9 is still located at the bottom of the transmission case (Fig. 102).**

12. Install the one-way clutch spring retainer into the outer race (Fig. 107).

13. Install the inner race inside of the spring retainer.

14. Install the individual springs between the inner and outer race as shown in Fig. 107.

15. Starting at the back of the transmission case, install the one-way clutch rollers by slightly compressing each spring and positioning the roller between the spring and the spring retainer.

16. After the one-way clutch has been assembled rotate the inner race clockwise to center the rollers and springs. Install the low and reverse drum (Fig. 101). The splines of the drum have to engage with the splines of the one-way clutch inner race. Check the one-way clutch operation by rotating the low and reverse drum. The drum should rotate clockwise but should not rotate counterclockwise.

17. Install thrust washer No. 8 on top of the low and reverse drum (Fig. 108). Install the low-reverse band in the case, with the end of the band for the small strut toward the low-reverse servo (Fig. 51).

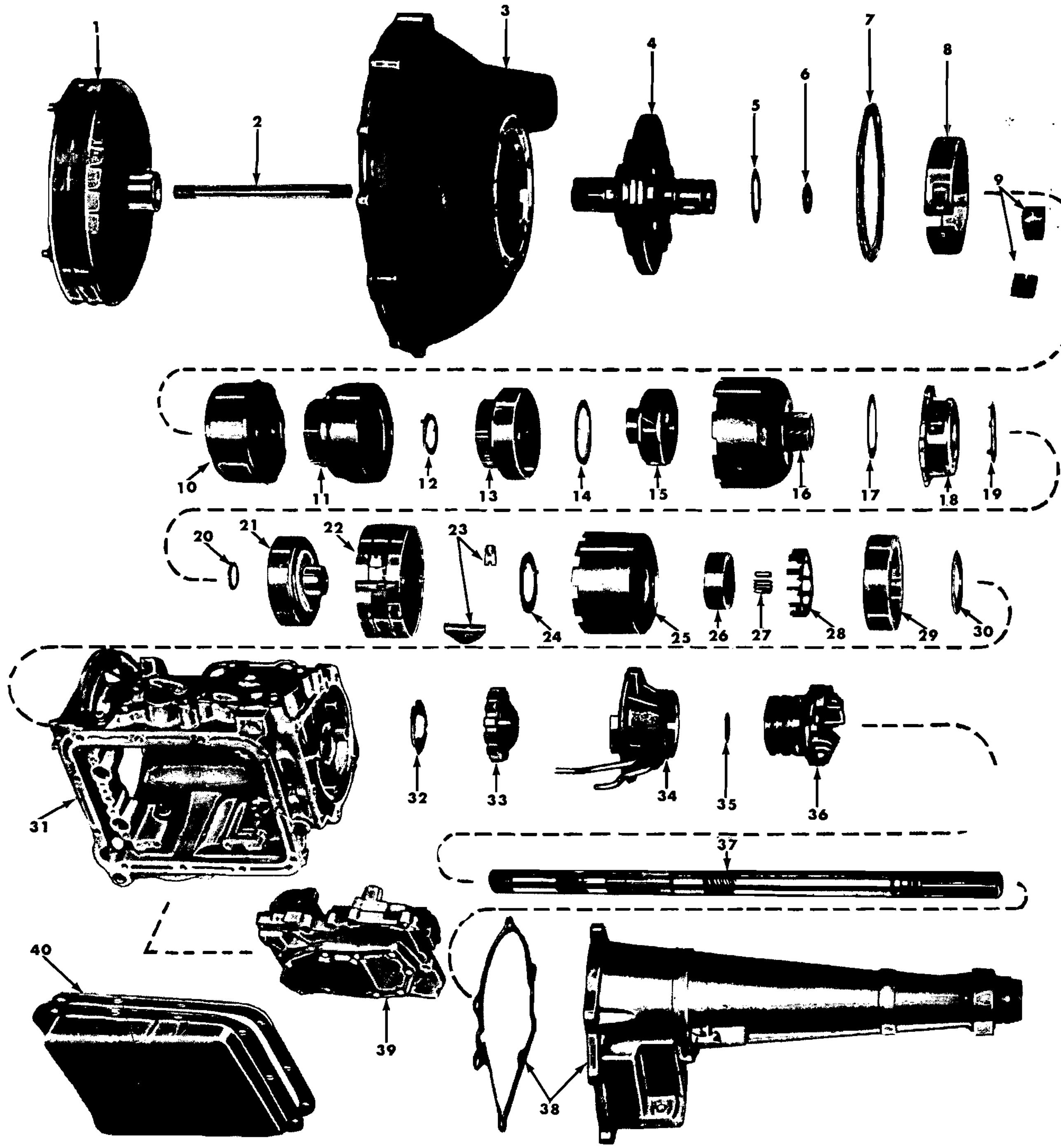
18. Install the reverse ring gear and hub on the output shaft.

19. Move the output shaft forward and install the reverse ring gear hub to output shaft retaining ring (Fig. 50).

20. Place thrust washers Nos. 6 and 7 on the reverse planet carrier (Fig. 109).

21. Install the planet carrier in the reverse ring gear and engage the tabs of the carrier with the slots in the low-reverse drum.

22. On the bench, install the forward clutch in the reverse-high clutch by rotating the units to mesh the reverse-high clutch plates with



1. CONVERTER
2. INPUT SHAFT
3. CONVERTER HOUSING
4. FRONT PUMP
5. THRUST WASHER NO. 1
6. THRUST WASHER NO. 2
7. FRONT PUMP GASKET
8. INTERMEDIATE BAND
9. BAND STRUTS
10. REVERSE AND HIGH CLUTCH DRUM
11. FORWARD CLUTCH AND CYLINDER
12. THRUST WASHER NO. 3
13. FORWARD CLUTCH HUB AND RING GEAR
14. THRUST WASHER NO. 4
15. FRONT PLANET CARRIER
16. INPUT SHELL, SUN GEAR AND THRUST WASHER NO. 5
17. THRUST WASHER NO. 6
18. REVERSE PLANET CARRIER
19. THRUST WASHER NO. 7
20. SNAP RING
21. REVERSE RING GEAR AND HUB
22. LOW AND REVERSE BAND
23. BAND STRUTS
24. THRUST WASHER NO. 8
25. LOW AND REVERSE DRUM
26. ONE-WAY CLUTCH INNER RACE
27. ROLLER (12) AND SPRING (12)
28. SPRING AND ROLLER CAGE
29. ONE-WAY CLUTCH OUTER RACE
30. THRUST WASHER NO. 9
31. CASE
32. THRUST WASHER NO. 10
33. PARKING GEAR
34. GOVERNOR DISTRIBUTOR SLEEVE
35. SNAP RING
36. GOVERNOR VALVES & DISTRIBUTOR
37. OUTPUT SHAFT
38. EXTENSION HOUSING AND GASKET
39. CONTROL VALVE BODY
40. OIL PAN AND GASKET

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FIG. 101—Transmission Sub-Assemblies

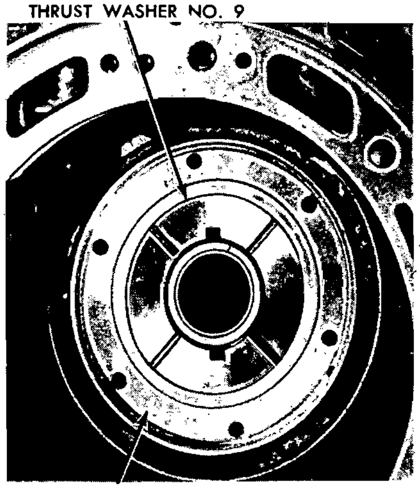


FIG. 102—Number 9 Thrust Washer Location

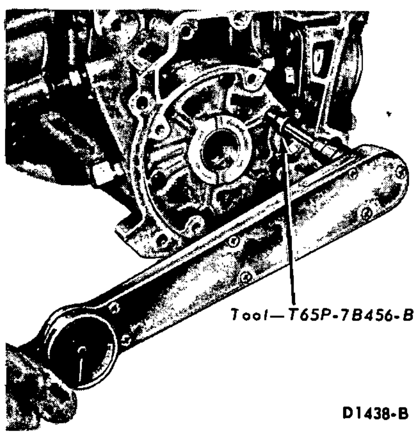


FIG. 103—Installing One-Way Clutch Outer Race Attaching Bolt

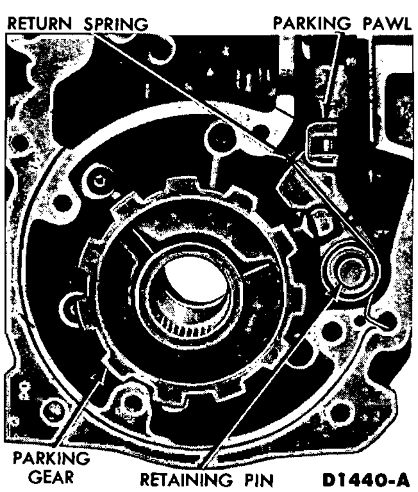


FIG. 104—Parking Pawl and Gear

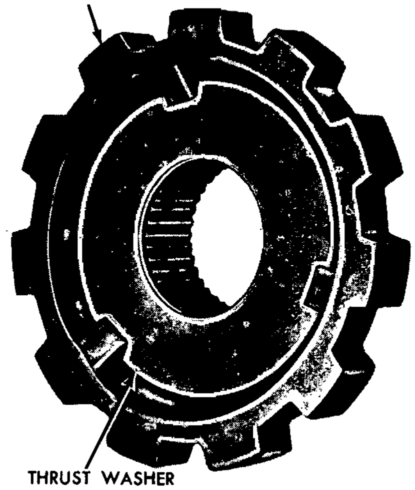


FIG. 105—Number 10 Thrust Washer Location

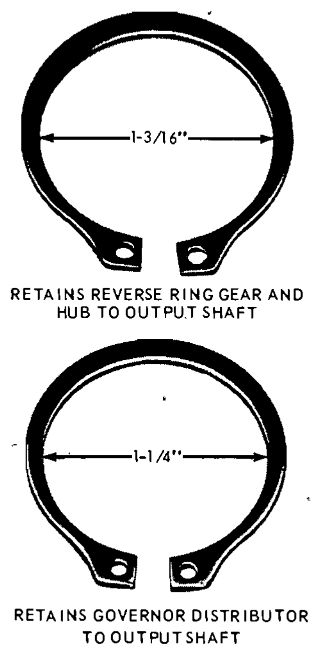


FIG. 106—Governor and Reverse Ring Gear and Hub Snap Ring Identification

the splines of the forward clutch (Fig. 110).

23. Using the end play check reading that was obtained during the transmission disassembly to determine which No. 2 steel backed thrust washer is required, proceed as follows:

a. Position the stator support vertically on the work bench and install the correct No. 2 thrustwasher to bring the end play within specifications.

b. Install the reverse-high clutch and the forward clutch on the stator support.

c. Invert the complete unit making sure that the intermediate brake drum bushing is seated on the forward clutch mating surface.

d. Select the thickest fiber washer (No. 1) that can be inserted between the stator support and the intermediate brake drum thrust surfaces and still maintain a slight clearance. Do not select a washer that must be forced between the stator support and intermediate brake drum.

e. Remove the intermediate brake drum and forward clutch unit from the stator support.

f. Install the selected Nos. 1 and 2 thrustwashers on the front pump stator support (Fig. 41) using enough vaseline to hold the thrust washers in position during the front pump installation.

24. Install thrust washer No. 3 on the forward clutch (Fig. 111).

25. Install the forward clutch hub and ring in the forward clutch by rotating the units to mesh the forward clutch plates with the splines on the forward clutch hub (Fig. 112).

26. Install thrust washer No. 4 on the front planet carrier (Fig. 113). Install the front planet carrier into the forward clutch hub and ring gear. **Check the forward thrust bearing race inside the planet carrier for proper location against the thrust bearing. Make sure the race is centered for alignment with the sun gear on the input shell (Fig. 114).**

27. Install the input shell and sun gear on the gear train (Fig. 115). Rotate the input shell to engage the drive lugs of the reverse-high clutch. If the drive lugs will not engage, the outer race inside the forward planet carrier is not centered to engage the end of the sun gear inside the input shell. Center the thrust bearing race and install the input shell.

28. Hold the gear train together and install the forward part of the gear train assembly in the case (Fig. 46).

The input shell sun gear must mesh with the reverse pinion gears. The front planet carrier internal splines must mesh with the splines on the output shaft.

29. A new band should be soaked in transmission fluid for fifteen minutes before it is installed. Install the intermediate band through the front of the case (Fig. 44) so that the arrow on the band end forging, points toward the front of the transmission.

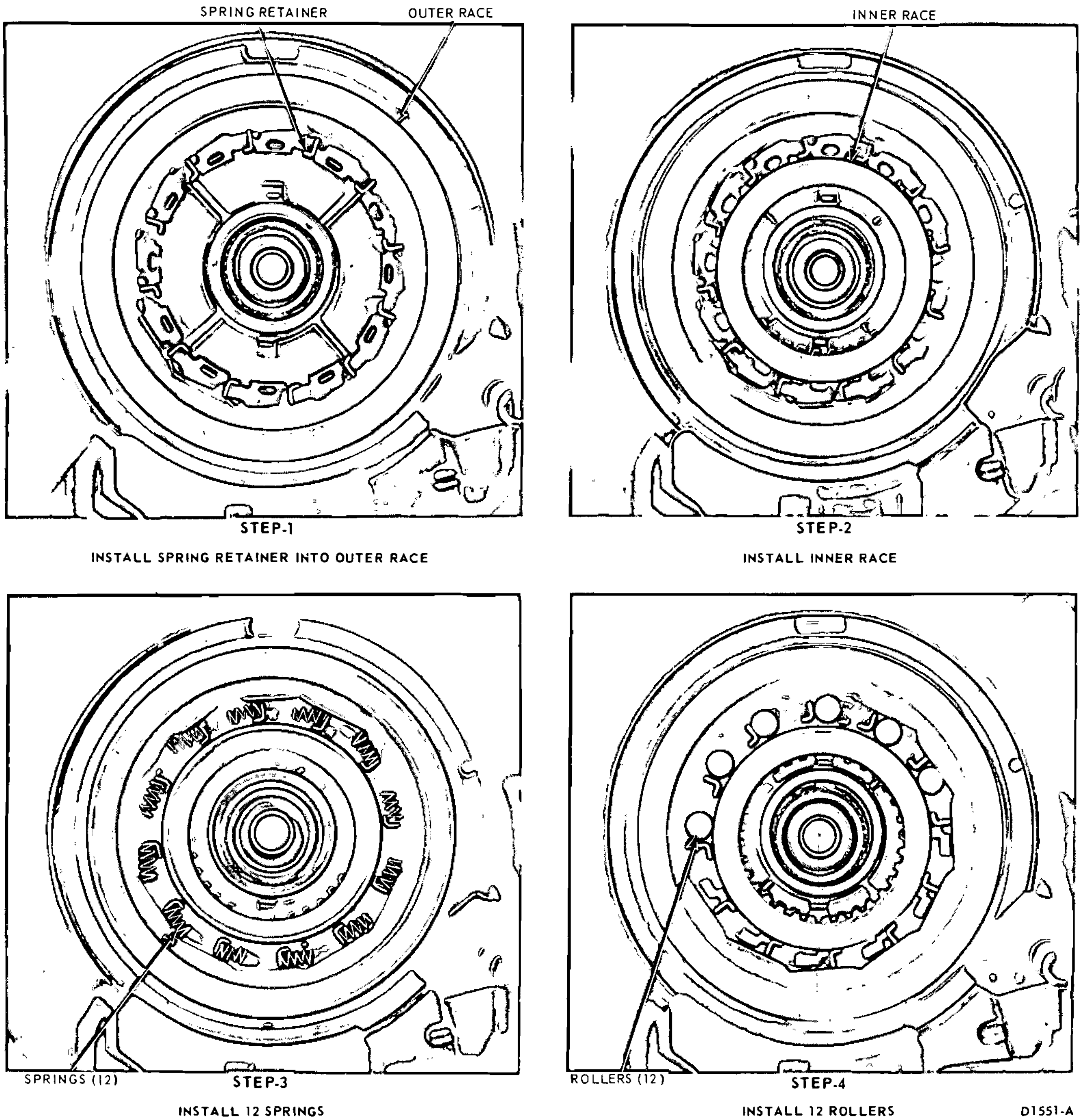


FIG. 107—One-Way Clutch Installation

30. Install a new front pump gasket on the case. Line up the bolt holes in the gasket with holes in the case.

31. Lubricate a new front pump O-ring seal with transmission fluid and install it on the pump. Install the front pump stator support into the reverse-high clutch. Align the pump-to-case attaching bolt holes.

32. Position the converter housing on the front pump and case. Install all but one front pump-to-case attaching bolts and torque them to specification.

33. Install the input shaft (Fig. 42).

Rotate the holding fixture to place the transmission in a horizontal position. Check the transmission end play as shown in Fig. 40. If the end play is not within specification, either the wrong selective thrust washers (Fig. 41) were used, or one of the 10 thrust washers (Fig. 101) is not properly positioned.

34. Remove the dial indicator used for checking the end play and install the one converter housing-to-case attaching bolt. Torque the bolt to specification.

35. Install the intermediate and low-reverse band adjusting screws in the case. Install the struts for each band (Fig. 39).

36. Adjust the intermediate and

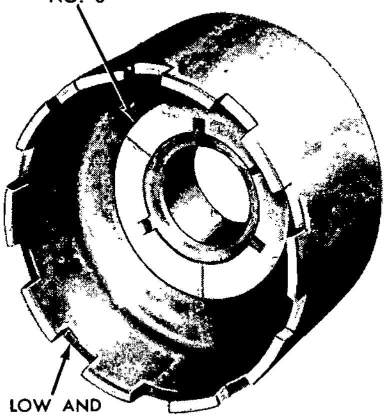


FIG. 108—Number 8 Thrust Washer Location

FIG. 110—Installing Clutch Units

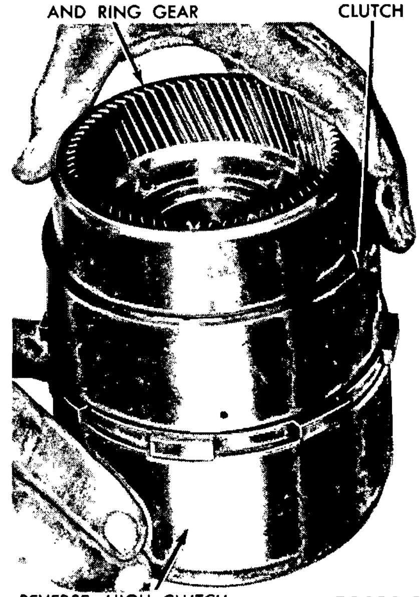


FIG. 112—Installing Forward Clutch Hub and Ring Gear

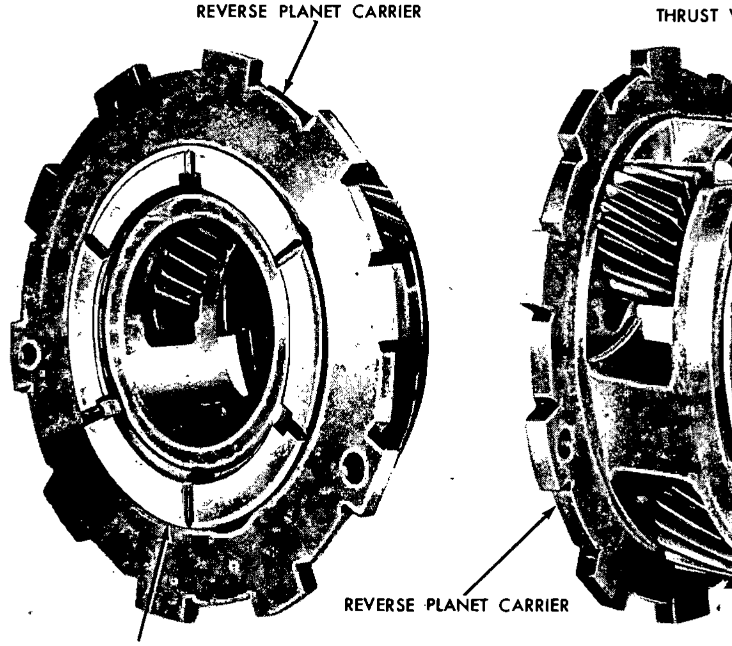


FIG. 109—Numbers 6 and 7 Thrust Washer Location

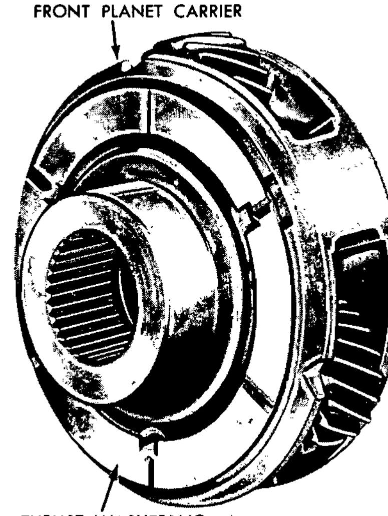


FIG. 113—Number 4 Thrust Washer Location

low-reverse band. Refer to In-Car Adjustments and Repair for band adjusting procedures.

37. Install a universal joint yoke on the output shaft. Rotate the input and output shafts in both directions to check for free rotation of the gear train.

38. Install the control valve body (Fig. 38). As the valve body is installed engage the manual and downshift valves with the inner control levers. Torque the eight control valve body-to-case attaching bolts to specification.

39. Place a new oil pan gasket on the case and install the oil pan and oil pan-to-case attaching bolts. Torque the bolts to specification.

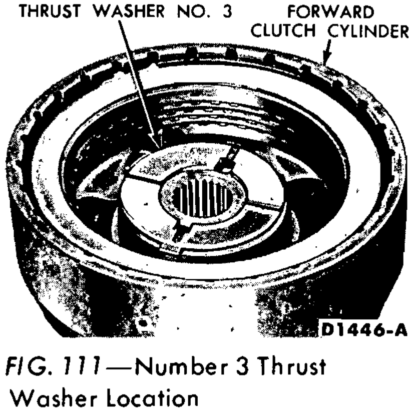


FIG. 111—Number 3 Thrust Washer Location

40. Remove the transmission from the holding fixture. Install the two extension housing-to-case attaching bolts. Torque the bolts to specification.

41. Install the primary throttle valve in the transmission case (Fig. 36).

42. Install the vacuum unit, gasket, and control rod in the case. Using the tools shown in Fig. 116, torque the vacuum unit to 15-23 ft-lbs.

FIG. 114—Installing Front Planet Carrier

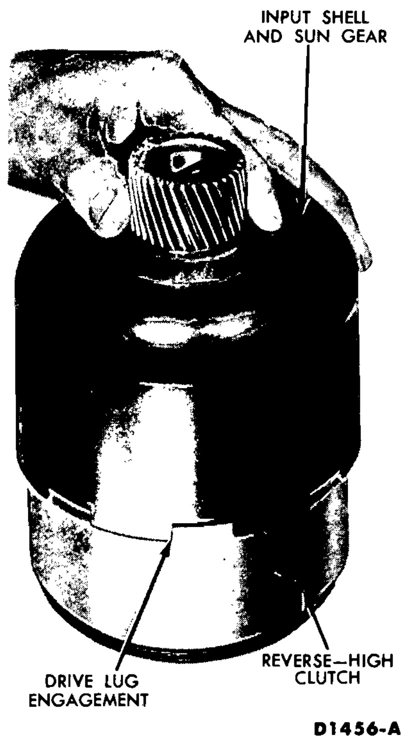


FIG. 115—Installing Input Shell

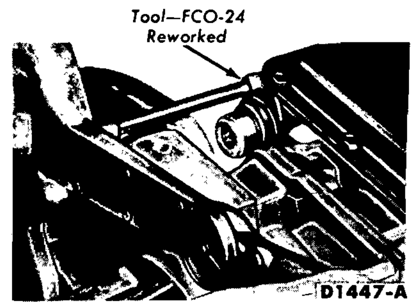


FIG. 116—Installing Vacuum Unit

43. **Make sure the input shaft is properly installed in the front pump stator support and gear train.** Install the converter in the front pump and the converter housing.

PART 7-3— C6 Automatic Transmission

1 DESCRIPTION AND OPERATION

DESCRIPTION

Figure 1 shows the location of the converter, front pump, clutches, gear train and most of the internal parts used in the C6 transmission. The identification tag (Fig. 2) attached by the servo cover bolt, includes the model prefix and suffix, as well as a service identification number and serial number. The service identification number indicates changes to service details which affect interchangeability **when the transmission model is not changed.** For interpretation of this number, see the Master Parts Catalog.

Figure 3 shows the engine and transmission model applications.

The C6 transmission is a three speed unit capable of providing automatic upshifts and downshifts through the three forward gear ratios, and also capable of providing manual selection of first and second gears. The converter housing and the fixed splines which engage the splined OD

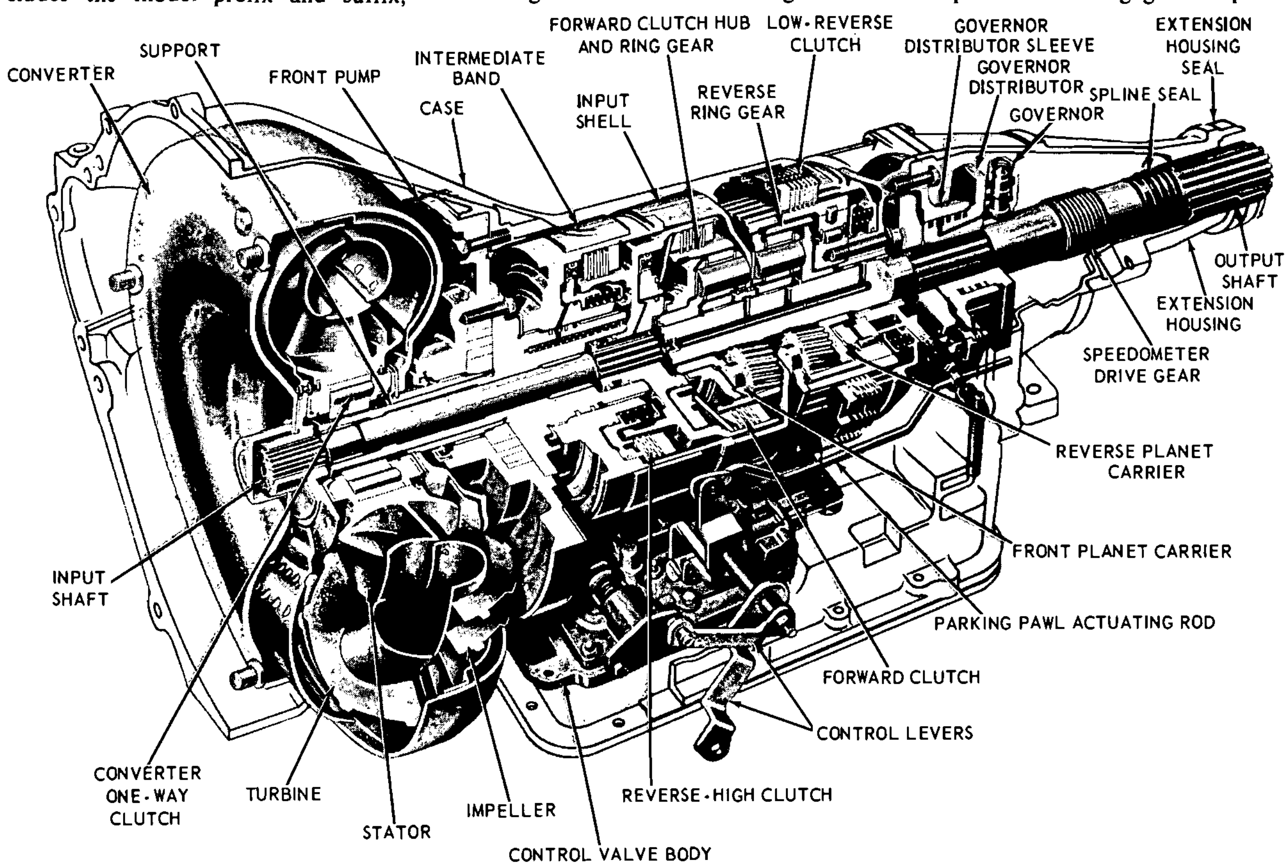


FIG. 1—C6 Automatic Transmission— Sectional

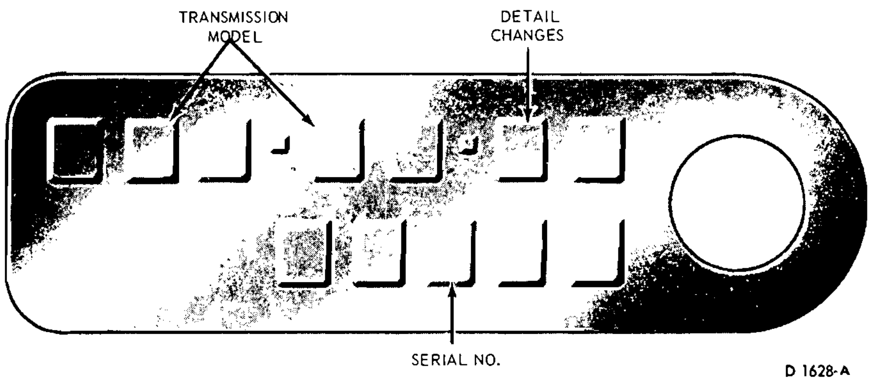


FIG. 2—Identification Tag

Car Model	Transmission Model	Engine Model
Comet-Fairlane (Col. Shift)	PGA-B	390-2V
Comet-Fairlane (Fl. Shift)	PGA-C	390-2V
Fairlane (Col. Shift)	PGA-F	390-4V
Fairlane (Fl. Shift)	PGA-G	390-4V
Comet-Fairlane (Fl. Shift)	PGA-M	390-4V GT
Mustang-Cougar (Fl. Shift)	PGA-P	390-4V GT
Fairlane (Col. Shift)	PGA-R	390-4V GT

***FIG. 3*—Engine and Transmission Application**

of the low-reverse clutch steel plates, are both cast integrally into the case.

Only one (intermediate) band is used in the C6 transmission. This along with the forward clutch is used to obtain intermediate gear.

The only adjustments on the transmission proper, are for the inter-

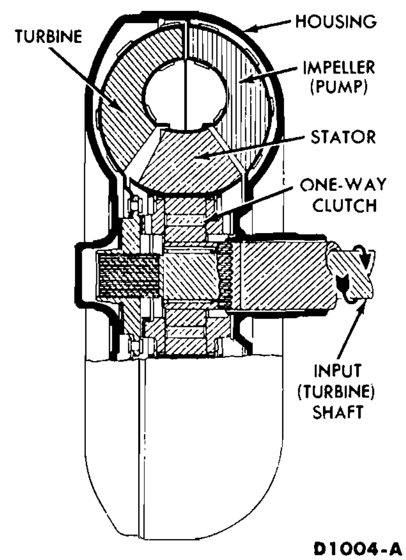


***FIG. 4*—Sectional View of Torque Converter—Typical**

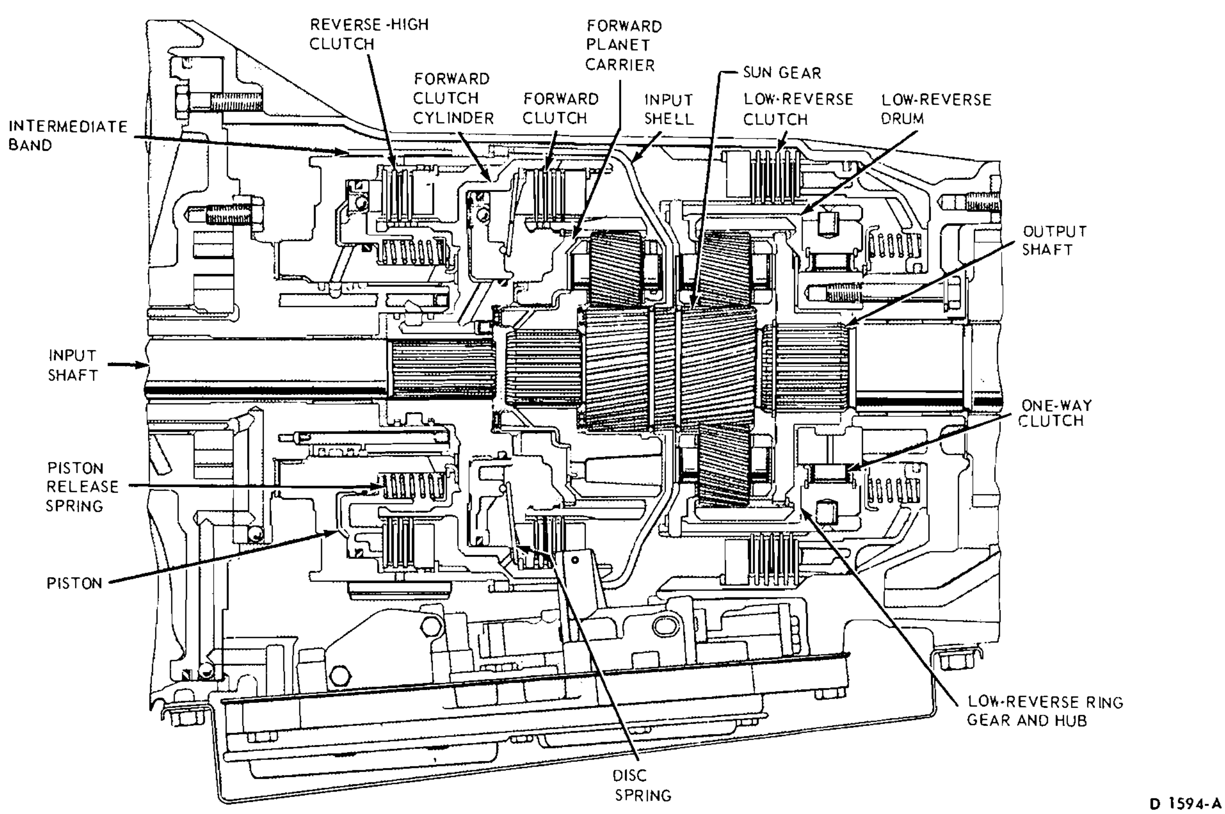


***FIG. 5*—Gear Train, Clutches and Band**

mediate band, and on Mustang and Cougar, the neutral safety switch.

The fluid is drained from the transmission by loosening the pan bolts and allowing it to drain. Then by finally removing all bolts except two from the front. This will allow the pan to drain more thoroughly.

OPERATION

TORQUE CONVERTER

The hydraulic torque converter (Fig. 4) consists of an impeller (pump), a turbine, and a stator. All these parts are enclosed and operate in a fluid-filled housing.

When the engine is running, the fluid in the torque converter flows from the impeller to the turbine and back to the impeller through the stator. This flow produces a maximum torque increase of about 2 to 1 when the turbine is stalled. When enough torque is developed by the impeller, the turbine begins to rotate, turning the turbine shaft (input shaft).

The converter torque multiplication gradually tapers off as turbine speed approaches impeller speed, and it becomes 1 to 1 when the turbine is being driven at 9/10 impeller speed. This is known as the "coupling point."

When the turbine is rotating at less than 9/10 impeller speed, the converter is multiplying torque. The fluid leaving the turbine blades strikes the front face of the stator blades. These blades are held stationary by the action of the one-way clutch (Fig. 4) as long as the fluid is directed against the front face of the blades.

When the turbine rotates faster than 9/10 impeller speed the converter no longer multiplies torque. The fluid is directed against the back face of the stator blades. As the one-way clutch permits the stator to rotate only in the direction of impeller rotation, the stator begins to turn with the impeller and turbine. The converter operates as an efficient fluid coupling as long as the turbine speed remains greater than 9/10 impeller speed.

A constant flow of fluid into and out of the converter is maintained. The fluid coming out of the converter is forced through a cooler located in the radiator tank.

PLANETARY GEAR TRAIN, CLUTCHES, BAND, AND SERVO

Planetary Gear Train

The gear train consists of an input shaft that is splined to the turbine of the converter and the forward clutch cylinder (Fig. 5). The forward clutch cylinder rotates the steel internal clutch plates of the forward clutch and the composition clutch plates of the reverse-high clutch. When the reverse high clutch is applied, the external area of the clutch hub is splined to and drives the input shell to rotate the sun gear. When the forward clutch is applied, the composition clutch plates drive the forward clutch hub and ring gear. The ring gear rotates the forward planet gears.

When applied, the intermediate band holds the reverse-high clutch drum, input shell and sun gear from rotating.

The sun gear, which is driven by the input shell, is meshed with the forward and reverse planet gears. The reverse planet carrier and low reverse clutch hub are locked together. The low-reverse clutch hub can be held from rotating by the reverse clutch. In D1 the low-reverse clutch hub is also held from rotating by a roller type one-way clutch.

The forward planet carrier, reverse ring gear hub, park gear and governor distributor are all splined to the output shaft.

Forward Clutch

The input shaft is splined to and drives the forward clutch cylinder (Fig. 5). Rotation of the cylinder drives the steel clutch plates in the forward clutch and the composition clutch plates of the reverse-high clutch.

When the forward clutch piston is applied by hydraulic pressure, the movement of the piston against the disc spring locks the steel and composition clutch plates together to drive the forward clutch hub and ring gear.

When hydraulic pressure is released from the piston, the disc spring moves the piston to the released position. As the disc spring moves, the steel and composition

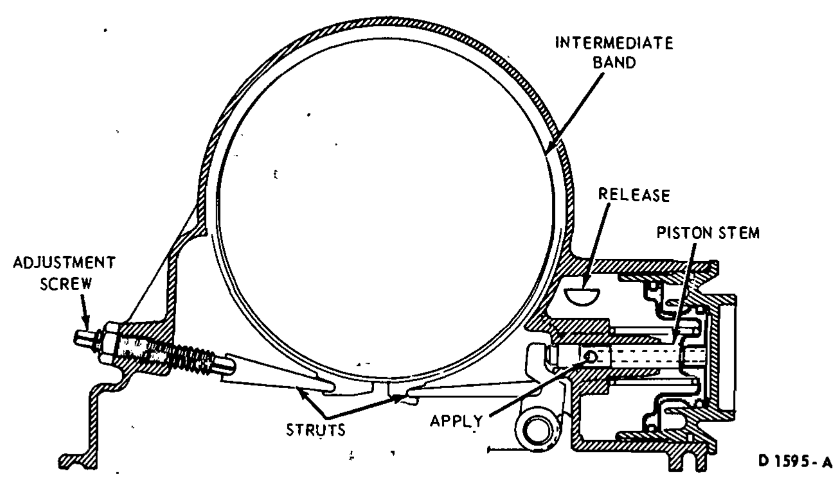
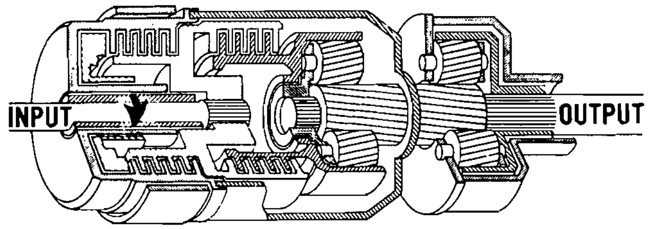


FIG. 6—Intermediate Servo and Band

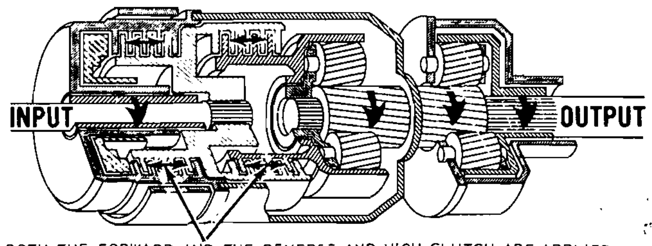
Gear	Gear Ratio	Intermediate Band	Direct Clutch	Forward Clutch	Reverse Clutch	One-Way Clutch
Low	2.46:1	Off	Off	On	On ①	Holding ①
Intermediate	1.46:1	On	Off	On	Off	Over-Running
Direct	1.00:1	Off	On	On	Off	Over-Running
Reverse	2.175:1	Off	On	Off	On	Not Affected
① Reverse clutch is applied in manual low; one-way clutch is holding in low gear of Drive Range.						

FIG. 7—Gear Ratios



CLUTCHES AND THE BAND ARE RELEASED

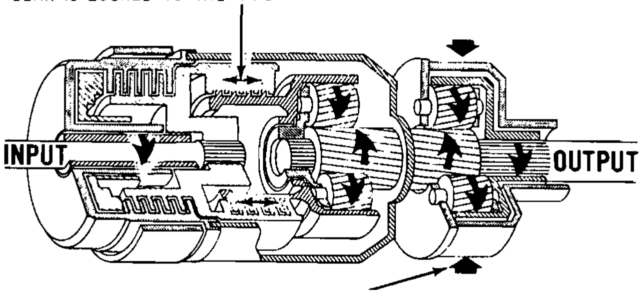
NEUTRAL



BOTH THE FORWARD AND THE REVERSE AND HIGH CLUTCH ARE APPLIED. ALL PLANETARY GEAR MEMBERS ARE LOCKED TO EACH OTHER AND ARE LOCKED TO THE OUTPUT SHAFT.

HIGH GEAR

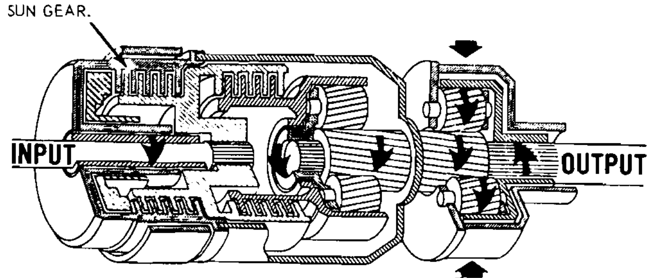
THE FORWARD CLUTCH IS APPLIED. THE FRONT PLANETARY UNIT RING GEAR IS LOCKED TO THE INPUT SHAFT.



THE LOW AND REVERSE CLUTCH (LOW RANGE) OR THE ONE-WAY CLUTCH (D1 RANGE) IS HOLDING THE REVERSE UNIT PLANET CARRIER STATIONARY.

FIRST GEAR

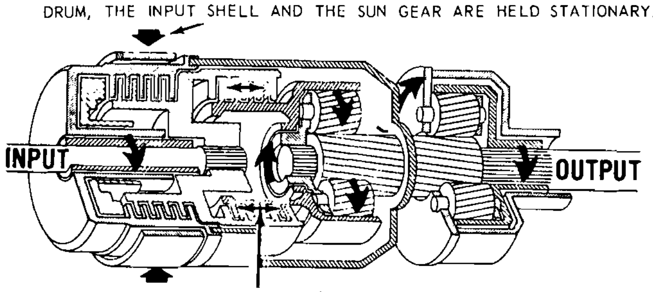
THE REVERSE AND HIGH CLUTCH IS APPLIED. THE INPUT SHAFT IS LOCKED TO THE REVERSE AND HIGH CLUTCH DRUM, THE INPUT SHELL AND THE SUN GEAR.



THE LOW AND REVERSE CLUTCH IS APPLIED. THE REVERSE UNIT PLANET CARRIER IS HELD STATIONARY.

REVERSE

THE INTERMEDIATE BAND IS APPLIED. THE REVERSE AND HIGH CLUTCH DRUM, THE INPUT SHELL AND THE SUN GEAR ARE HELD STATIONARY.



THE FORWARD CLUTCH IS APPLIED. THE FRONT PLANETARY UNIT RING GEAR IS LOCKED TO THE INPUT SHAFT.

SECOND GEAR

GEAR RATIOS
FIRST 2.46:1
SECOND 1.46:1
HIGH 1.00:1
REVERSE 2.17:1

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FIG. 8—Power Flow C6 Transmission

clutch plates are released. This stops the rotation of the forward clutch hub and ring gear (Fig. 5). The forward clutch is applied in all forward drive gear ratios.

Reverse-High Clutch

When hydraulic pressure is directed to the clutch piston, the piston moves against the release springs (Fig. 5). The piston movement locks the steel and rotating composition clutch plates together. The steel clutch plates drive the reverse high clutch drum which is splined to the input shell. Rotation of the input shell drives the sun gear which is splined to the input shell.

To release the reverse-high clutch, hydraulic pressure is exhausted from the apply side of the piston. The return springs move the piston to the released position. The steel and composition clutch plates are now released to stop rotation of the reverse-high clutch drum, input shell and sun gear.

Intermediate Servo and Band

The intermediate servo is machined into the transmission case and the band has an **external** adjustment screw (Fig. 6). To apply the servo, hydraulic pressure is directed from the control valve body, through a hole in the case to the hole in the servo piston stem. The pressure passes through the center of the piston stem and then to the apply side of the piston. The piston moves against the return spring to tighten the intermediate band around the reverse-high clutch drum.

To release the servo piston, hydraulic pressure is directed to the release side of the piston. The release pressure is assisted by the compressed return spring to move the servo piston and intermediate band to the OFF position. The intermediate servo and band are applied only during the intermediate gear operation.

POWER FLOW

All Gear Rotations are viewed from the front of transmission. Figure 7 shows the gear ratios obtained in the different selector lever positions.

Power Flow Neutral

In neutral (Fig. 8) the clutches or bands are not applied, therefore, no power is transmitted to the output shaft.

Power Flow First Gear

In low gear (Fig. 8), the forward clutch is applied, and the planet one-way clutch or reverse clutch is holding the reverse planet carrier from rotating. The power flow is through the input shaft and into the forward clutch. The input shaft is splined to and drives the forward clutch cylinder. Rotation of the forward clutch drives the forward clutch hub and ring gear. The ring gear rotates the forward planet gears clockwise to cause the sun gear to rotate counterclockwise.

Counterclockwise rotation of the sun gear turns the reverse planet gear clockwise. The reverse planet carrier being splined to the low-reverse clutch hub is held from rotating by the one-way clutch or reverse clutch.

With the reverse planet carrier held stationary, the clockwise rotation of the reverse planet gears rotates the reverse ring gear. The hub of the reverse ring gear is splined to the output shaft and rotates the output shaft clockwise.

The output shaft rotation is at a reduced speed, compared to the input shaft rotation, but at an increased torque.

The output shaft rotation at a reduced speed is caused by the fact that the forward planet carrier rotates at the same speed of the output shaft and in the same direction since the carrier is splined to the output shaft. The forward ring gear and planet assembly are rotating in the same direction, but the planet carrier is rotating at a slower speed than the ring gear. Therefore, the low gear ratio (torque multiplication) is a combination of the ratios provided by the forward and reverse planet assemblies.

Power Flow Intermediate Gear

In intermediate gear (Fig. 8), the forward clutch is applied and the intermediate band is holding the reverse-high clutch drum, input shell and sun gear from turning.

The power flow is through the input shaft into the forward clutch and forward planet assembly ring gear. The sun gear is held from rotating by the intermediate band. This causes the forward planet pinions to rotate (walk) around the sun gear, carrying the forward planet carrier with them. The forward planet carrier, being splined to the output shaft, causes clockwise rotation of the output shaft at a reduction in speed compared to the speed of the input shaft, and at an increase in torque.

Clockwise rotation of the output shaft causes clockwise rotation of the output shaft ring gear, causing the reverse planet pinions to also rotate (walk) around the sun gear in a clockwise direction. The reverse planet carrier will also rotate clockwise and the one-way clutch inner race, being splined to the reverse planet carrier, will overrun.

Power Flow High Gear

In high gear (Fig. 8), the forward and reverse-high clutches are applied. The power flow is through the input shaft into the forward clutch cylinder. (The forward clutch cylinder rotates the steel clutch plates of the forward clutch and the composition clutch plates of the reverse-high clutch). The forward clutch directs the power flow through the forward clutch hub and ring gear to the forward planet carrier.

The reverse-high clutch directs the power flow through the input shell to the sun gear. With the sun gear and the forward clutch hub ring gear driven at the same speed the forward planet assembly (that is splined to the output shaft) is forced to rotate the output shaft at the same speed and direction to provide high gear.

Power Flow Reverse

In reverse (Fig. 8), the reverse-high clutch and reverse clutch are applied. The power flow is through the input shaft, reverse-high clutch, input shell and to the sun gear. Clockwise rotation of the sun gear causes counterclockwise rotation of the reverse planet gears.

The reverse-clutch, holding the reverse planet carrier from turning, causes the reverse planet gears to rotate counterclockwise.

This rotates the reverse ring gear and hub counterclockwise. The hub splined to the output shaft rotates the output shaft counterclockwise at a reduction in speed and at an increase in torque for reverse gear.

HYDRAULIC CONTROL SYSTEM (EARLY PRODUCTION)

A change was incorporated in the main control assembly during 1967 production. The following is a description of the hydraulic control system in early production units. Differences in late production control

	Early Production		Late Production	
Main Control Identification	AG, AJ, AS	AR, AW	AP, AY, AU, AK, AM, AT	AL, AN, AV, AX
Separator Plate Identification	2-V Notches	2 Half-Moon Notches	1 Square Notch	2 Square Notches
Gasket Identification	No Notch		1 Semicircular Notch	

FIG. 9—Main Control and Separator Plate Identification

assemblies are described at the end of this section. Figure 9 shows the main control and separator plate identification.

Front Pump

Fluid for operation of the hydraulic control system (Fig. 10) is supplied by a gear type pump mounted on the front of the transmission case. Pump intake is through a screen which is part of the main control assembly, into the case casting and pump. Discharge is through the case into the main control assembly. Fluid from the front pump is directed to the main oil pressure regulator valve, throttle booster valve, manual valve and coasting regulator valve.

In addition, fluid is also directed to the primary throttle valve, which is located in the rear of the case. Fluid delivered to these valves is at a pressure controlled by the main oil pressure regulator valve.

Main Oil Pressure Regulator Valve.

The main regulator valve assembly consists of the main oil pressure regulator valve and spring, main oil pressure booster valve, and sleeve. This assembly is located in one bore of the main control assembly.

Fluid is delivered to two valleys of the main regulator valve from the front pump. The difference in diameter between the end land and the second land provides an area differential for regulation. Fluid pressure in this area tends to move the valve against spring force. Spring force is such that at approximately 60 psi front pump pressure, the main valve will move so that the fourth land uncovers the converter feed port, allowing additional pump volume to be used to charge the converter and provide fluid for cooling and lubrication. If volume supplied by the front pump is greater than that required to maintain 60 psi line pressure and converter and lube requirements, the valve will move further allowing the third land to uncover the port which allows excess pump volume to be discharged into the sump.

Pressures over 60 psi which are required under various operating conditions are obtained by delivering fluid under pressure to the pressure booster valve, where it will cause the pressure booster valve to assist the main regulator valve spring in increasing regulated line pressure.

Source of these pressures which cause variations in control pressure are discussed later.

Manual Valve

One passage delivers control pressure to the manual valve. The valve is positioned by the manual linkage according to mode of operation desired. Fluid is directed from the manual valve through the following passages (Fig. 10):

1. D
2. 2
3. D-2-1
4. 1-R
5. R

The D passage is charged in drive range only.

The (2) passage is charged in manual second gear range only.

The D-2-1 passage is charged in all forward ranges.

The 1-R passage is charged in manual low gear and in reverse gear.

The R passage is charged only in reverse gear.

In park and neutral, the valve blocks the flow of control pressure and exhausts the five (5) passages leading from the manual valve (except for 2 in P).

The D passage supplies fluid to the throttle downshift valve, the 2-3 shift valve and the end of the line pressure coasting regulator valve.

The 2 passage supplies fluid to the adjoining ends of the 1-2 and D-2 shift valves.

The D-2-1 passage supplies fluid to the governor secondary valve, the end of the D-2 shift valve and the forward clutch.

The 1-R passage supplies fluid to the valley of the manual low 2-1 scheduling valve and the D-2 shift valve. When the D-2 valve is in the closed (up) position, fluid is directed through it to the low-reverse clutch and to the large diameter land of the manual low 2-1 scheduling valve.

The R passage supplies fluid to the upper valley of the pressure booster valve, and through the 2-3 shift valve to the direct drive clutch, applying it, and to the release side of the intermediate servo. Fluid is also supplied to the upper end of the 2-3 backout valve.

Primary Throttle Valve

The primary throttle valve is actuated by changes in manifold vacuum. Primary throttle pressure starts at 20 inches (nominal) of mercury vacuum. Primary throttle pressure is delivered to the:

1. End of the pressure booster valve.
2. Lower valley of pressure booster valve (through cutback valve and coasting boost valves -- under certain conditions of valve position).
3. Throttle modulator valve (through throttle booster valve).
4. End of the throttle booster valve.
5. Spring end of the 2-3 backout valve.
6. Intermediate servo accumulator valve.

Fig. 11 shows how primary throttle pressure varies with engine vacuum.

Main Oil Pressure Booster Valve

Forward Driving Ranges (D, 2, 1). TV pressure is delivered to the lower valley of the pressure booster valve and to the end of the pressure booster valve. Force created on the booster valve by TV pressures in these two areas is added to the main regulator valve spring force transmitted to the main regulator valve. This will provide increased control pressure required to compensate for increased throttle openings and engine torque output. Fig. 12 shows how control pressure varies with engine vacuum at zero output shaft rpm.

Reverse (R). Additional fluid pressure is required in reverse to prevent clutch and/or band slippage

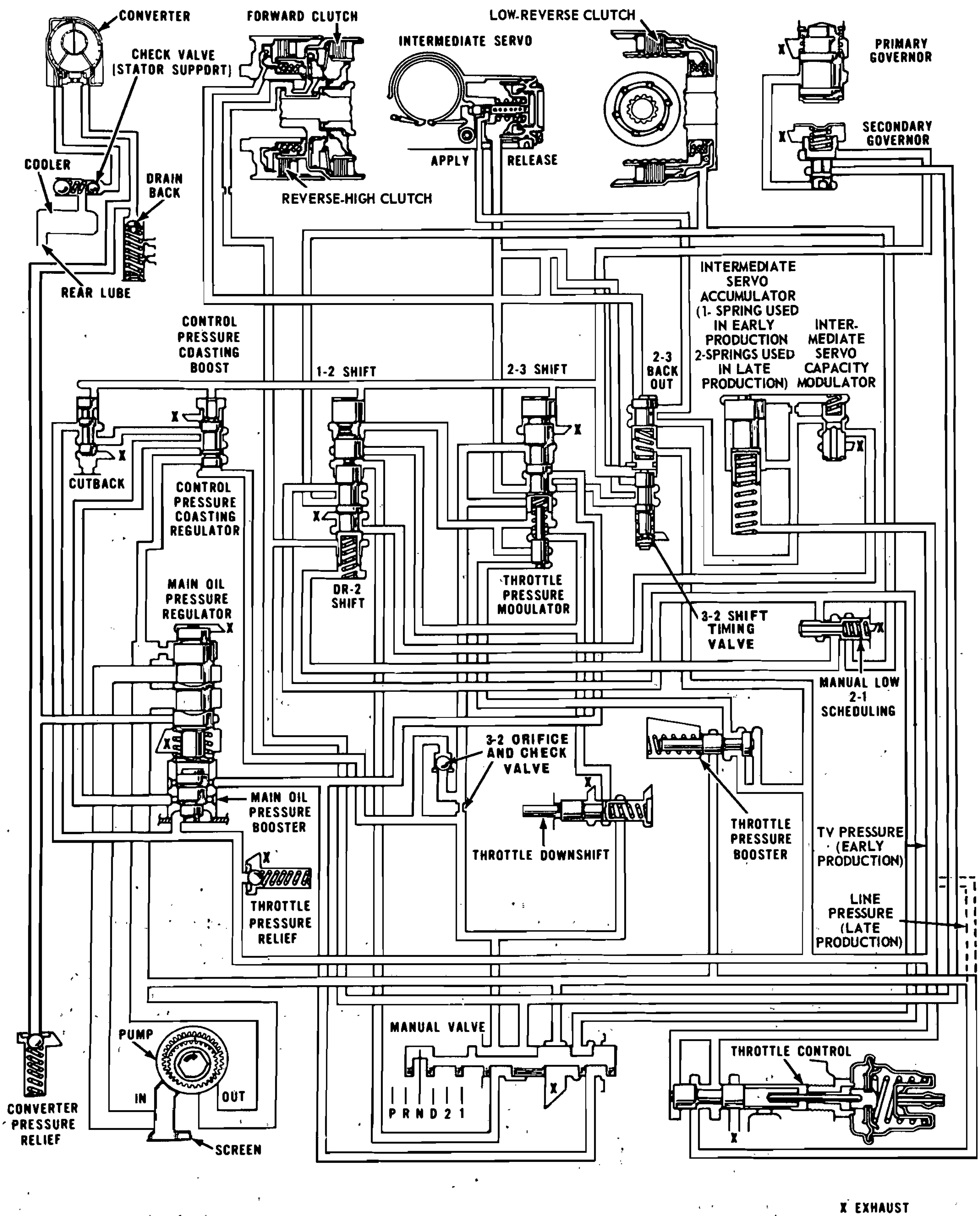


FIG. 10—Hydraulic Control System

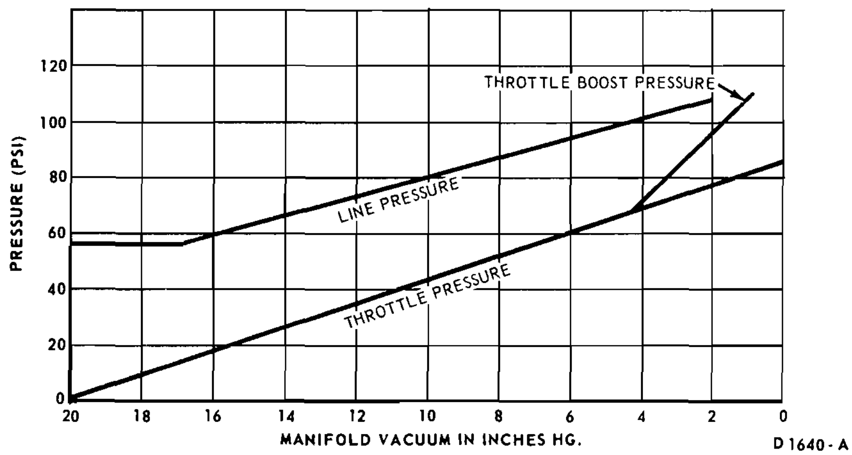


FIG. 11—Primary Throttle Pressure, Throttle Boost Pressure and Control Pressure Versus Engine Manifold Vacuum

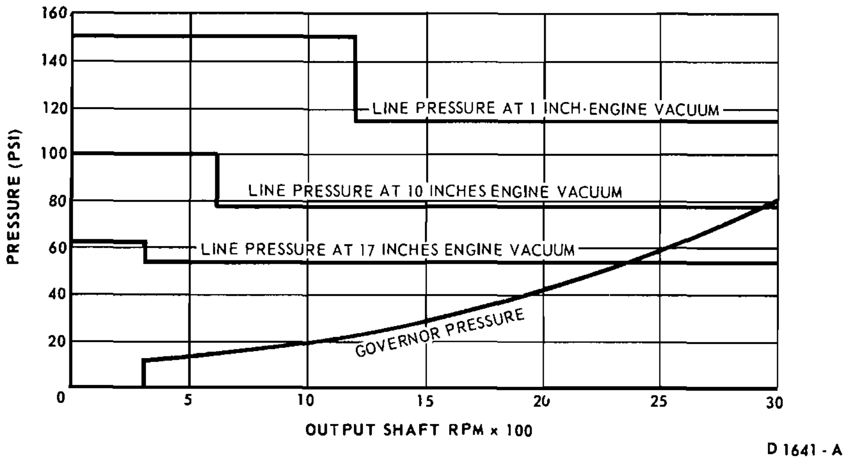


FIG. 12—Control Line Pressure and Governor Pressure Versus Output Shaft rpm

under stall or partial stall conditions. This additional pressure is provided by directing line pressure to the upper valley of the pressure booster valve when reverse range is selected. The differential in area between the lands of this valve provides a force which is added to the TV pressure forces present in the lower valley and on the end of the valve, to boost line pressure to a higher value than is available in the forward driving ranges.

Governor

At Rest (0 MPH). Control pressure (line) is fed to the secondary governor valve through the center passage in the valve body. Because of the differential in area of the inner and outer lands of the valve, the valve will be forced inward, shutting off line pressure feed to the governor passage and allowing this passage to be opened to exhaust, at the inner end of the valve. At the same time, line pressure will pass by two flats on the outer end of the valve, pressurizing the line leakage passage leading to the primary governor valve. At rest, the spring on the outer end of the primary governor valve holds the primary governor valve inward, blocking further flow of the fluid in the line leakage passage. This causes pressure in the line leakage passage to build to the same value as line pressure. As a consequence, the secondary governor valve is held in and there is no pressure in the governor circuit.

Above 10 MPH. When speed reaches approximately 10 mph, centrifugal force on the primary governor valve overcome spring force, and the valve moves outward, opening the line leakage passage to exhaust. This action reduces the pressure on the end of the secondary governor valve to zero (0), allowing the secondary valve to also move outward, due to spring force and centrifugal force. When the secondary valve moves outward, it closes the governor exhaust passage, and allows line pressure to enter the governor passage. As pressure builds in the governor passage, it will create a force on the secondary governor valve due to the differential in areas of the inner and outer lands of the valve. This force tends to move the valve inward. When the force on the valve created by pressure in the governor passage exceed the centrifugal force plus spring force, the valve will move inward, allowing governor pressure to exhaust, and close the passage between line pressure and governor pressure. When governor pressure is reduced, the secondary valve will again move outward, closing the governor exhaust port and opening the line pressure to governor passage. Above 10 mph, governor pressure is regulated in this manner, and will vary with the car speeds.

If the car speed drops below 10 mph, the primary valve spring will move the primary governor valve in, closing the line leakage exhaust port at the primary valve. Pressure in the line leakage passage will become equal to line pressure, forcing the secondary governor valve in. This action shuts off line pressure feed to the governor passage and exhausts the governor circuit.

When the secondary governor valve is regulating, governor pressure is delivered to the end of the:

1. 3-2 timing valve
2. 2-3 shift valve
3. 1-2 shift valve
4. Coasting boost valve.
5. Cut back valve

Fig. 12 shows the relationship between governor pressure and output shaft rpm.

Throttle Booster Valve

Throttle plate openings above 50 ° provide very little change in engine vacuum as compared to throttle plate openings below 50 ° The throttle booster valve is used to boost throttle pressure and provide the necessary shift delay for engine throttle plate openings above 50 °

Below approximately 65 psi primary TV pressure, TV pressure flows to and through the throttle boost valve unaffected, working on the end of the boost valve and on the area differential in the first valley.

When TV pressure increases above 65 psi, the force created by TV pressure acting on the end of the throttle boost valve, minus the force of TV pressure acting on the area

differential in the first valley will exceed the force of the spring. This causes the valve to move against the spring, closing off primary TV pressure to the area differential and permitting this area to be fed from line pressure, causing a boost in the pressure used for shift delay only. Because the area of the end of the throttle boost valve exceeds the area differential in the first valley by 3 to 1, throttle boost pressure above 65 psi primary TV pressure will increase 3 psi for each 1 psi increase in primary TV.

Figure 11 shows the relationship between primary TV pressure and boosted throttle pressure.

Throttle Modulator Valve

The throttle modulator valve, located in the end of the 2-3 shift valve bore reduces throttle pressure which acts on the end of the 2-3 shift valve and on the area differential of the 1-2 shift valve. Modulated throttle pressure in these areas provides shift delay in relation to throttle opening.

Cutback Valve

Increased line pressure is required to prevent clutch and band slippage under stall conditions. Dependent upon car speed, the requirements for increased line pressure are considerably reduced. When governor pressure acting on the end of the cutback valve exceeds the force of TV pressure acting on its area opposing governor, the cutback valve will move cutting off primary TV pressure being fed to the lower valley of the pressure booster valve, thru the coasting boost valve. This action reduces the assist that the pressure booster valve provides to the main regulator valve spring. The cutback valve movement will therefore vary with engine throttle opening and car speed. Figure 12 shows how line pressure varies with output shaft rpm (car speed) at constant vacuum values.

Line Pressure Coasting Regulator and Boost Valves:

When the selector lever is moved from D to 2 or 1 to force a 3-2 (closed throttle) downshift in order to use the engine as a brake, additional pressure may be required to insure positive band applications. With the throttle closed there will be no TV pressure present at the pressure booster valve. At speeds above approximately 30 mph, the required additional pressure is obtained through the use of the coasting boost valve and coast-

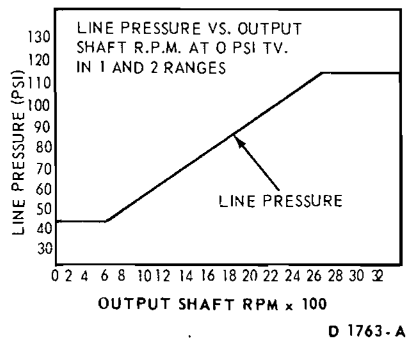


FIG. 13—**Line Pressure Versus Output Shaft rpm**

ing regulator valve. When the manual valve is shifted from D to 2 (second gear hold) or 1 (manual low), line pressure is exhausted from the end of the coasting regulator valve, allowing governor pressure and spring force to move the coasting regulator and boost valve, train downward in the bore. This allows line pressure to pass through the coasting boost valve to the lower valley of the pressure booster valve, increasing main line pressure. As line pressure tends to increase, the higher pressure working on the differential area of the coasting regulator valve causes the valve to move upwards. This causes the supply of line pressure to the pressure booster valve to be cut off, and line pressure is again reduced. The valve continues this regulating cycle until the car has slowed down to the point where governor pressure, acting on the end of the coasting boost valve, together with spring force, is no longer sufficient to overcome the force of line pressure acting on the area differential. In this manner boost in line pressure is regulated by car speed, the higher the speed, the higher the pressure (above approximately 30 mph.) (Fig. 13).

1-2 Shift Valve Train

The 1-2 shift valve train is composed of the 1-2 shift valve, the D2 valve, and the 1-2 shift valve spring.

D Range. In D range the 1-2 shift valve is held closed (up) by modulated throttle pressure acting on the differential area between the two lands of the 1-2 shift valve, by D fluid pressure acting on the differential in area between the two lands at the spring end of the D2 valve, and by the 1-2 shift valve spring. Governor pressure tends to move the 1-2 shift valve train against these forces. When force created by governor pressure exceeds the forces holding the 1-2 shift valve train closed, the 1-2 shift valve and D2 valve will be opened (move downward), closing the exhaust port and allowing D fluid to pass through the D2 valve to accomplish the 1-2 shift. When the D2 valve is moved downward, D fluid is exhausted from the differential in areas provided by the lower two lands of the D2 valve and modulated throttle pressure from area differential on 1-2 valve. This action eliminates the force created by D fluid which tends to hold the 1-2 shift valve train closed.

If governor pressure is reduced to the point where spring force exceeds governor pressure force, the 1-2 shift valve train will move up (close) cutting off the flow of D fluid through the valve and opening the exhaust port allowing a downshift to low gear.

If the throttle is opened through detent, the downshift valve moves to allow line pressure to enter the modulated throttle pressure passage at the 1-2 shift valve to provide a forced 2-1 downshift.

1 Range. Once the transmission is in low gear 1-R fluid, which is directed to the D2 valve, passes through the D2 valve and is delivered to the spring end of the D2 valve, preventing an upshift 1-R fluid which passes through the D2 valve also applies the reverse clutch. Coasting downshifts to first gear are not possible above approximately 30 mph in low range.

2 Range. In 2 range, 2 fluid is introduced between the 1-2 shift and D2 valves. This action opens the D2 valve and holds it open, providing a second gear start and preventing a 2-1 downshift.

Intermediate Servo Accumulator and Capacity Modulator Valves

The intermediate servo accumulator and capacity modulator valves are used to control the rate of band application during a 1-2 shift.

During operation in first gear prior to the 1-2 shift, control pressure is present on the end of the accumulator valve and holds the valve up in its bore against spring pressure.

When the 1-2 shift valve train moves to make a 1-2 shift, line pressure passes thru the D-2 valve and goes to the capacity modulator valve. This pressure passes thru the capacity modulator valve bore, goes to the differential in area between the two lands of the accumulator valve and thru the 2-3 backout valve to ap-

ply the intermediate servo. This same fluid also passes thru a hole in the center of the capacity modulator valve to the end of the valve, and also thru an orifice which feeds the fluid to the spring ends of the accumulator and capacity modulator valves.

The fluid which passes thru the center of the intermediate servo capacity modulator valve tends to move the valve upward against spring force. However, the spring effort and fluid pressure created by the fluid which has passed thru the orifice to the spring end of the valve will hold the valve down.

As fluid flows thru the orifice to the spring ends of the accumulator and capacity modulator valves, and pressure increases on the spring ends of the valves, the accumulator valve starts to move downward. This movement of the accumulator valve causes a flow of fluid thru the orifice, resulting in a lower pressure existing on the spring sides of the valves.

As a consequence, the fluid pressure on the end of the capacity modulator valve opposite the spring will be higher than the pressure on the spring end of the valve, causing the valve to move upward. This action cuts off fluid supply to the intermediate servo (and thru the orifice) and opens an exhaust port at the end of the capacity modulator valve. When the exhaust port opens, the pressure on the end of the capacity modulator valve opposite the spring is reduced, allowing the valve to again move downward and opening the line to the intermediate servo apply.

In this manner, the intermediate servo capacity modulator valve regulates to control the intermediate servo apply during a 1-2 shift, until the intermediate servo accumulator valve has fully bottomed in its bore and there is no more fluid flow thru the orifice.

2-3 Shift Valve

The 2-3 shift valve is held closed by throttle modulator valve spring force, modulated throttle pressure force, and by D fluid pressure force acting on the differential in area of the lands of the valve to which it is delivered.

Governor pressure tends to open the 2-3 shift valve. When force created by governor pressure exceeds the forces holding the valve closed, the valve will move downward (open) closing the exhaust passage (through the manual valve) and opening the D passage to allow D fluid to apply the reverse-high clutch and release the intermediate servo.

With the shift valve open (down) the throttle modulator valve is held down cutting off modulated throttle pressure to the 2-3 shift valve and 1-2 shift valve. In addition, the port which delivered D fluid to the differential in area of the shift valve lands, is closed.

The shift valve will be reopened (moved up) causing a downshift under one or more of the following conditions:

Governor Pressure Reduced. If governor pressure is reduced to the point where it can no longer hold the shift valve down against spring force, the valve will move up causing a downshift. Under closed throttle conditions, the 2-3 shift valve will close at approximately 10 mph, (speed at which governor pressure is cut off). Since governor pressure is cut off at this speed, the 1-2 shift valve train also closes at the same time. This will provide a 3-1 downshift when coasting in D range.

Throttle Pressure Increased. If throttle pressure is increased sufficiently, it will move the throttle modulator valve and consequently the 2-3 shift valve up, causing a 3-2 torque demand downshift.

Line Pressure Introduced Below 2-3 Shift Valve. If the downshift valve is moved through detent, line pressure is directed to the underside of the 2-3 shift valve, forcing the valve up and causing a forced 3-2 downshift. Maximum 3-2 forced downshift speed is controlled by governor pressure.

In addition to the above, a 3-2 downshift will occur when the manual valve is moved to 1 range. The D passage which feeds fluid to the 2-3 shift valve will then be opened to exhaust, allowing reverse-high clutch apply—intermediate servo release fluid to exhaust and causing a 3-2 downshift.

2-3 Back-out Valve

The purpose of the 2-3 back-out valve is to provide smooth upshifts, when the throttle is suddenly closed while accelerating in second gear. Operation is as follows:

Normal Throttle-On 2-3 Upshifts. When the 2-3 shift valve moves to cause a 2-3 upshift, D fluid passes through the valve to apply the direct clutch and release the intermediate servo. This same fluid is also directed to the end of the 2-3 back-out valve. However, with throttle open, primary throttle pressure on the opposite end of the 2-3 back-out valve, assists spring force in holding the valve up, so that there will be no valve movement until after the 2-3 shift has been completed.

Back-Out 2-3 Upshifts. When the throttle is closed during a 2-3 upshift, and before the shift is completed, there may be enough pressure in the reverse-high clutch cylinder to apply the clutch at the reduced engine torque input, but not enough pressure to release the intermediate servo. This condition could cause a harsh 2-3 shift. However, if the throttle is closed during a 2-3 shift, primary throttle pressure will be reduced to zero (0), and reverse-high clutch apply pressure on the end of the 2-3 back-out valve will move the valve down against spring force. This action immediately connects the clutch apply circuit to the intermediate servo apply circuit, reducing the pressure on apply side of the servo to the same value as in the reverse-high clutch (and also on the release side of the intermediate servo). When this happens, the intermediate band is released, to provide a smooth 2-3 shift.

Manual Low 2-1 Scheduling Valve

When the selector lever is moved from D or 2 to 1 range to provide engine braking, line pressure from the manual valve is routed to the area differential of the 2-1 scheduling valve, and moves the valve to the right, compressing the spring. As the valve continues to move to the right the line pressure feed port is closed off and pressure escapes through the right hand port (low-reverse clutch apply circuit) which at this point is open to exhaust at the 1-2 shift valve. As the pressure acting on the area differential drops, the spring forces the valve to the left, closing off exhaust and repressurizing the area differential. The pressure resulting from this regulating cycle is routed to the spring end of the D2 shift valve. When governor pressure on the upper end of the valve drops to the appropriate value, 2-1 scheduling pressure together with spring force will force the D2 shift valve upwards, effecting a downshift.

3-2 Shift Timing Valve

The 3-2 shift timing valve moves in response to variations in governor pressure, which is routed to the upper end of the valve. However, the valve is non-functional, and its position does not affect the operation of the control assembly.

2-3 Shift Orifice and Check Valve

During a 2-3 upshift the 2-3 shift valve moves downward in its bore, routing fluid to the direct clutch and the release side of the servo to engage high gear. During the upshift the 2-3 shift orifice check ball remains seated in the orifice bypass hole, so that direct clutch apply-servo release fluid is metered through the 2-3 shift orifice to time the shift. When the manual lever is moved to 2 or 1 to force a 3-2 downshift, the 2-3 shift orifice check ball unseats to allow the release fluid to bypass the orifice and exhaust without further obstruction.

HYDRAULIC CONTROL SYSTEM (LATE PRODUCTION)

The control assembly was changed to incorporate a new intermediate servo accumulator valve. The new valve is the same as the accumulator valve used in early production models, except that two springs are used at the upper end of the valve instead of one spring at the lower end. In addition, the lower end of the new accumulator valve is pressurized with line pressure instead of TV pressure (Fig. 10).

Line pressure on the lower end of the servo accumulator valve holds the valve upward in its bore against the force of spring pressure. When the 1-2 shift valve train moves downward in the bore, signalling an upshift into 2 range, line pressure is directed from the D2 shift valve to the intermediate servo capacity modulator valve. The accumulator and capacity modulator valves then operate exactly the same as in earlier production models to produce a modulated pressure which is routed to the apply side of the intermediate servo, applying the servo and upshifting the transmission to second gear.

2 IN-VEHICLE ADJUSTMENTS AND REPAIRS

CONTROL LINKAGE ADJUSTMENTS

The transmission control linkage adjustments should be performed in the order in which they appear in this section of the manual.

THROTTLE AND DOWNSHIFT LINKAGE ADJUSTMENTS

1. Apply the parking brake and place the selector lever at N.

2. Run the engine at normal idle speed. If the engine is cold, run the engine at fast idle speed (about 1200 rpm) until it reaches normal operating temperature. When the engine is warm, slow it down to normal idle speed.

3. Connect a tachometer to the engine.

4. Adjust engine idle speed to the specified rpm with the transmission selector lever at D or 2, the drive positions.

5. **The carburetor throttle lever must be against the hot idle speed adjusting screw at the specified idle speed in D.** To make sure that the carburetor throttle lever is against the idle adjusting screw, refer to Group 10 for the carburetor adjusting procedures.

COMET AND FAIRLANE LINKAGE—390-CID ENGINE

1. Disconnect the bellcrank-to-carburetor rod at point C and the accelerator rod from the throttle shaft at point B (Fig. 14).

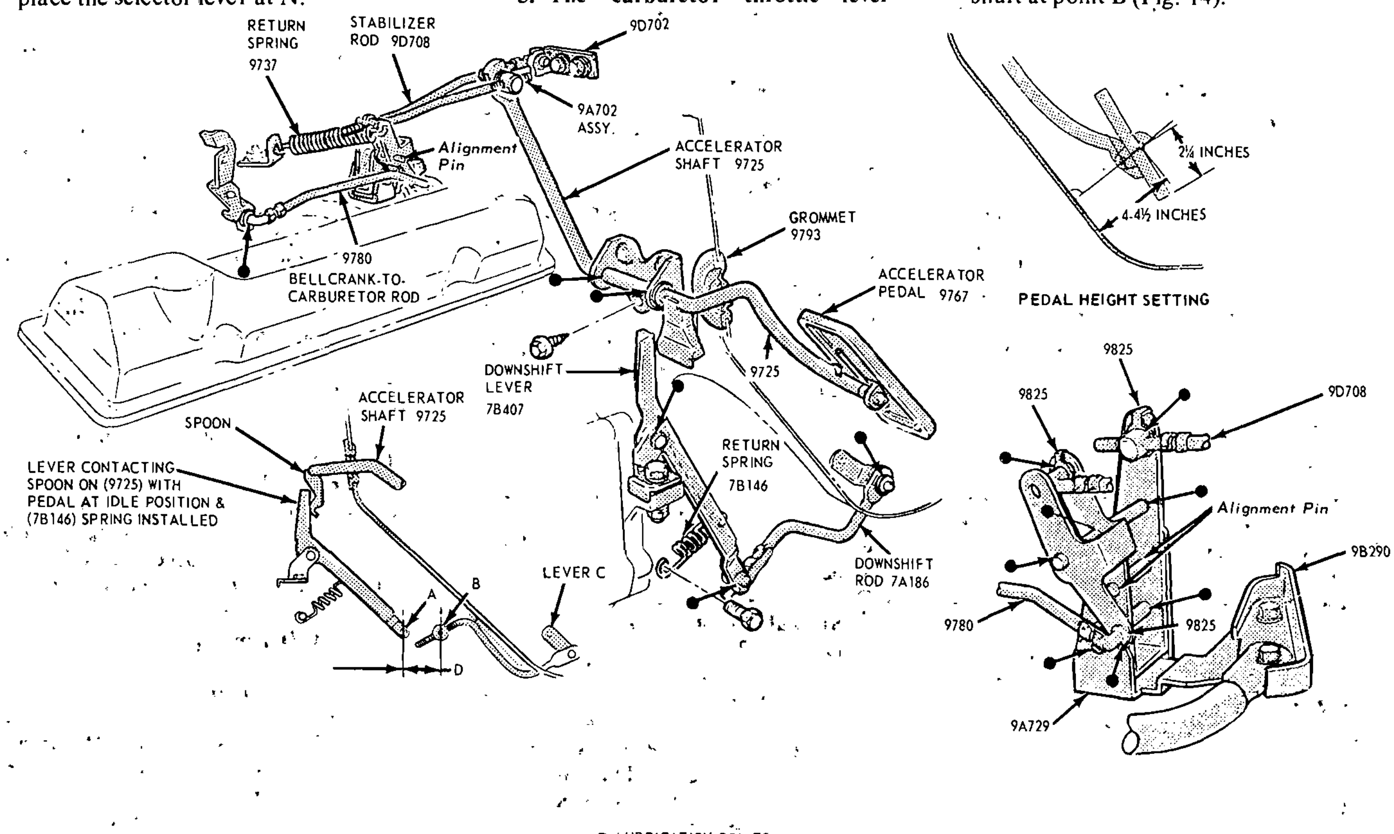


FIG. 14—Throttle Linkage—Comet and Fairlane with 390 CID Engine

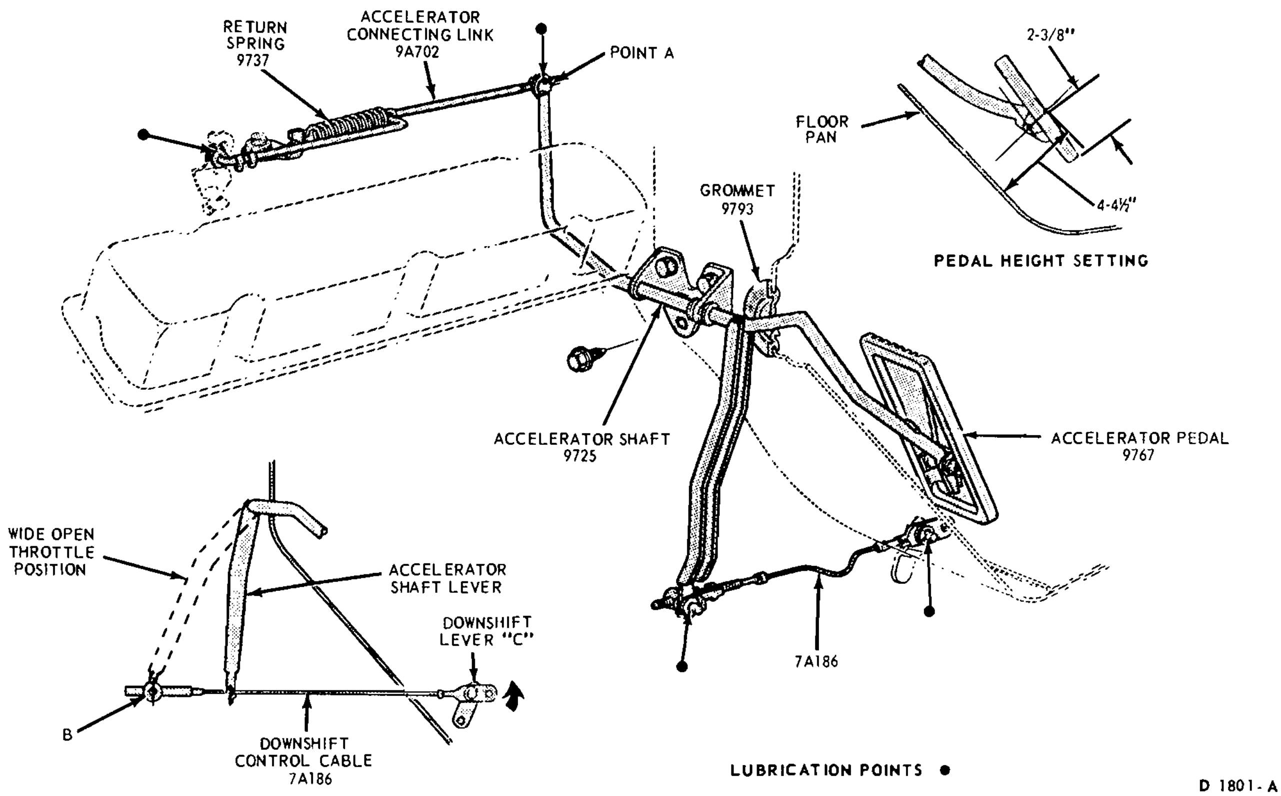


FIG. 15—Throttle Linkage—Mustang and Cougar with 390 CID Engine

2. Disconnect the stabilizer rod from the stabilizer at point A.
3. Insert a 1/4 inch diameter pin through the stabilizer and the bracket (Fig. 14).
4. Adjust the length of the stabilizer rod so that the trunnion enters the stabilizer freely. Secure the stabilizer rod with the retaining clip.
5. Secure the carburetor-to-bellcrank rod to the bellcrank with the attaching clip at point C.
6. Adjust the length of the accelerator rod to obtain an accelerator pedal height of 4-4 1/2 inches measured at the pedal as shown in Fig. 11. Connect the accelerator rod to the accelerator shaft with the retaining clip after the proper accelerator pedal height has been established.
7. With the engine off, disconnect the downshift rod from the lever at point D (Fig. 14).
8. With the carburetor choke in the off position, depress the accelerator pedal to the floor. Block the pedal to hold it in the wide open position.
9. Rotate the downshift lever on the transmission in a counterclockwise direction to place it against the internal stop.
10. Adjust the trunnion at point D so that it enters the downshift lever freely.
11. Turn it one additional turn counter clockwise to lengthen the rod. Secure it to the lever with the retaining clip.
12. Remove the block from the accelerator pedal.

MUSTANG AND COUGAR LINKAGE—390-CID ENGINE

1. With the engine off, check the accelerator pedal for a height of 4 1/2 inches measured from the top of the pedal at the pivot point (Fig. 15) to the floor pan. To obtain the correct pedal height, adjust the accelerator connecting link at point A.
2. With the engine OFF, disconnect the downshift control cable at point B from the accelerator shaft lever.
3. With the carburetor choke in the off position, depress the accelerator pedal to the floor. Block the pedal to hold it in the wide open position.
4. Rotate the downshift lever C counter clockwise to place it against the internal stop.
5. With the lever held in this position, and all slack removed from the cable, adjust the trunnion so that it will slide into the accelerator shaft lever. Turn it one additional turn clockwise, then secure it to the lever with the retaining clip.
6. Remove the block to release the accelerator linkage.

MANUAL LINKAGE ADJUSTMENT

COMET AND FAIRLANE

Column Shift

1. Place the selector lever in the D position tight against the D stop.
2. Loosen the nut at point A enough to permit column shift lever to slide on the shift rod (Fig. 16).
3. Shift the manual lever at the transmission into the D detent position, third from the rear.
4. Make sure that the selector lever has not moved from the D stop; then, tighten the nut at point A.
5. Check the pointer alignment and the transmission operation for all selector lever detent positions.

Console Shift

1. Move the selector lever to the D detent position against the stop.
2. Raise the car and loosen the manual linkage rod attaching nut (Fig. 17). Move the transmission manual lever to the D position, fourth from the rear. The last detent position is low position.
3. With the selector lever and the transmission manual lever in the D position, tighten the rod attaching nut to 20 to 25 ft-lbs torque.

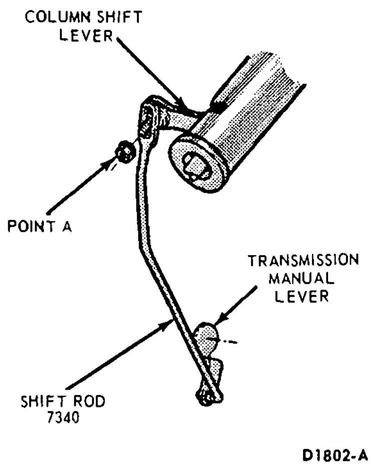


FIG. 16—Manual Linkage—Column Shift

4. Working from inside of the car, remove the selector lever handle attaching screw. Lift the handle off the selector lever.

5. Remove the console trim panel from the top of the console.

6. Remove the cover and dial indicator as an assembly.

7. Remove the six screws that secure the selector lever retainer to the selector lever housing. Lift the retainer from the housing.

8. Disconnect the neutral start switch wires at the plug connector. Disconnect the bulb socket from the selector lever housing.

9. Remove the three bolts that secure the selector lever control housing to the console. Lift the selector lever housing from the console.

10. Remove the selector lever to

necessary adjust the height of the detent pawl as shown in Figure 19.

14. Remove the handle from the selector lever.

15. Position the selector lever housing in the console. Install the three attaching bolts (Fig. 17).

16. Connect the bulb socket to the selector lever housing and the neutral start switch wires to the plug connector.

17. Position the selector lever retainer to the selector lever housing. Install the six attaching screws.

18. Install the cover and dial indicator.

19. Position the console trim panel and secure it with the attaching screws.

20. Install the handle and the button on the selector lever. Secure the

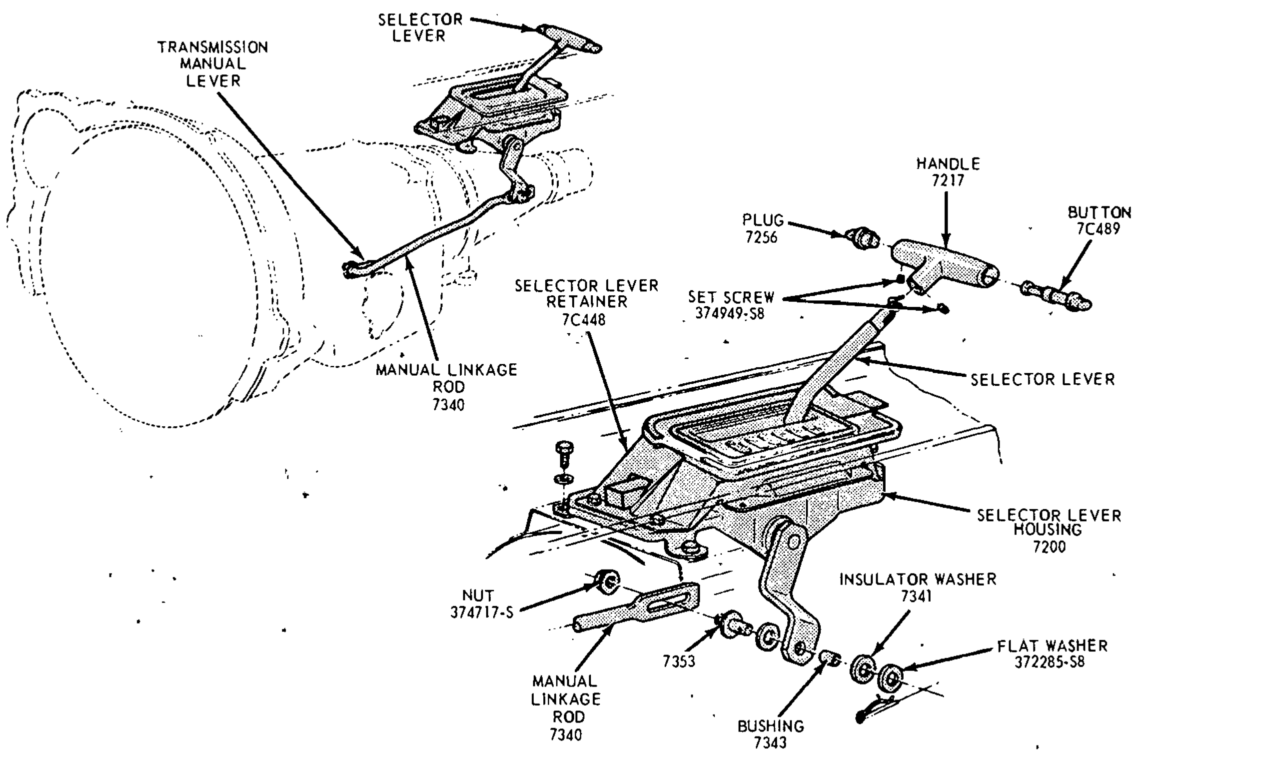


FIG. 17—Manual Linkage Console— Comet and Fairlane

Selector Lever Removal, Adjustment and Installation

1. Raise the car on a hoist or jack stands.

2. Remove the retainer that secures the manual linkage rod to the lower end of the manual lever (Fig. 17).

3. Remove the flat washer and two insulator washers and disconnect the rod from the arm.

housing attaching nut. Remove the lever from the housing.

11. Install the selector lever in the housing and install the attaching nut. Torque the nut to 20 to 25 ft-lbs.

12. Install the selector lever handle.

13. Position the selector lever as shown in Figure 19. With a feeler gauge, check the clearance between the detent pawl and plate. The clearance should be 0.005 to 0.010 inch. If

handle with the set screw.

21. Secure the manual linkage rod to the arm with two insulating washers, a flat washer and a retainer (Fig. 17).

22. Adjust the linkage as required. Lower the car.

MUSTANG—COUGAR LINKAGE ADJUSTMENT

1. Position the transmission selec-

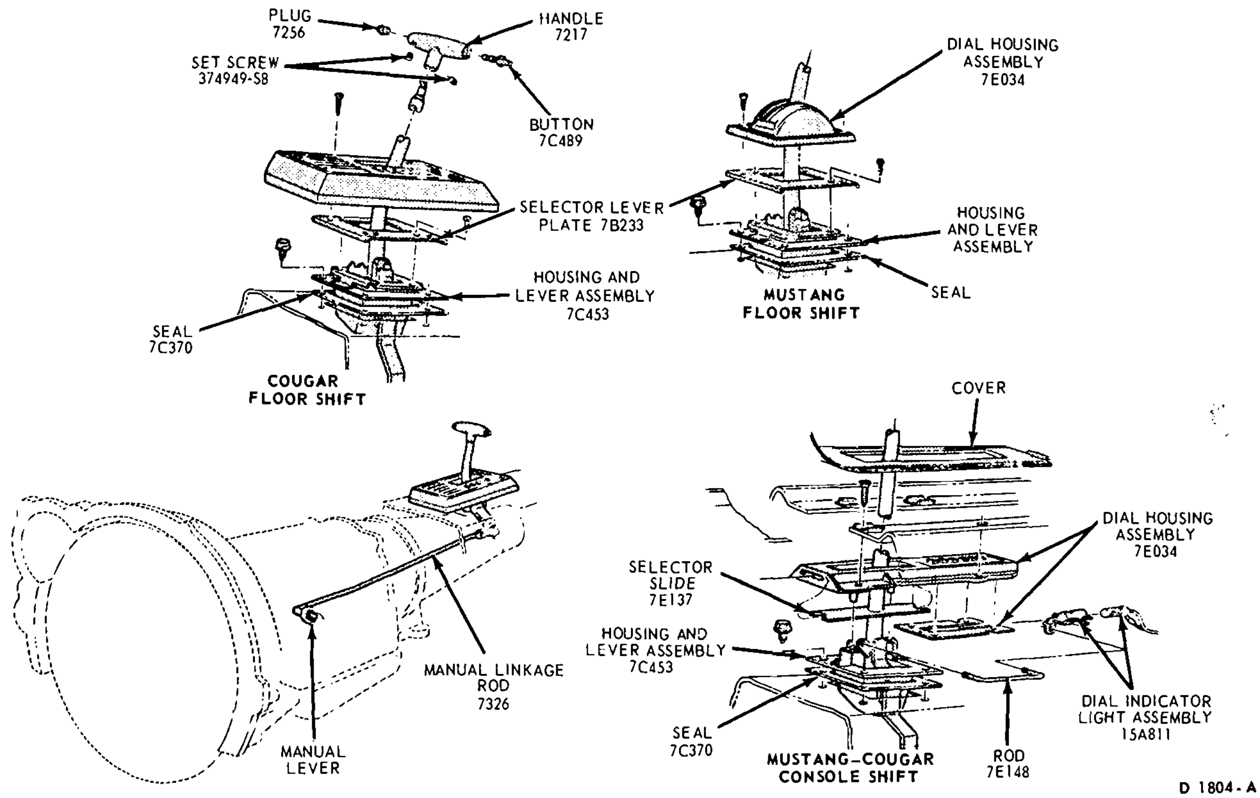


FIG. 18—Manual Linkage—Mustang— Cougar

tor lever in D position (Fig. 18).

2. Raise the car and loosen the manual lever control rod retaining nut. Move the transmission manual lever to the D position, fourth detent position from the back of the transmission. The last detent position is manual low.

3. With the transmission selector lever against the stop and manual lever in the D positions, torque the attaching nut 20 to 25 ft-lbs.

4. Check the operation of the transmission in each selector lever position.

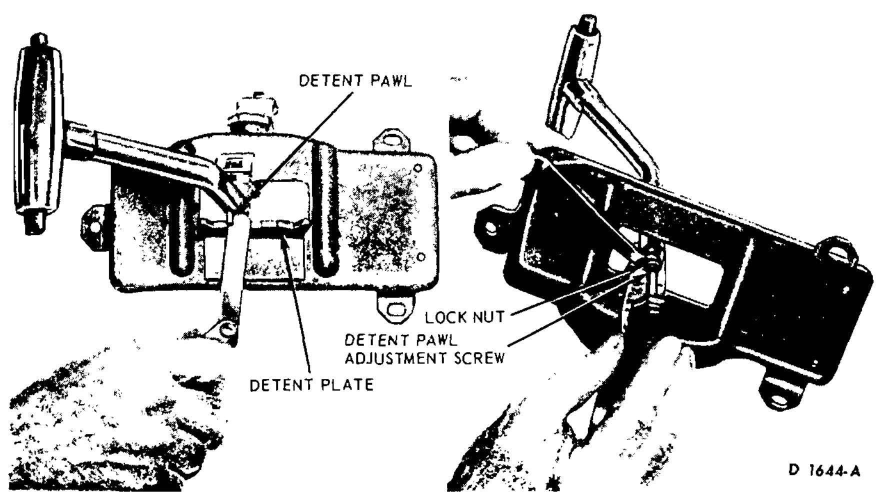


FIG. 19—Selector Lever Detent Pawl Adjustment

Selector Lever Removal Adjustment and Installation

1. Raise the car and remove the manual lever control rod attaching nut (Fig. 18).

2. Lower the car, remove the selector lever handle attaching screw.

3. Remove the dial housing attaching screws and the housing.

4. Remove the selector lever plate attaching screws and the plate.

5. Disconnect the dial indicator light (Fig. 19).

6. Remove the selector housing and lever assembly attaching bolts. Remove the selector lever and housing.

7. Remove the selector lever to housing attaching nut (Fig. 19). Remove the lever from the housing.

8. Install the selector lever in the housing and install the attaching nut. Torque the nut to 20 to 25 ft-lbs.

9. Install the dial indicator light.

10. Install the selector lever handle.

11. Position the selector lever as shown in Figure 19. With a feeler gauge check the clearance between the detent pawl and plate. The clearance should be 0.005 to 0.010 inch. If necessary adjust the height of the detent pawl as shown in Figure 19.

12. Remove the handle from the selector lever.

13. Install the selector housing and lever assembly as shown in Figure 18. Torque the attaching bolts 4-6 ft-lbs.

14. Connect the dial indicator light.

15. Install the selector lever plate and tighten the attaching screws.

16. Install the dial housing and tighten the attaching screws.

17. Install the selector lever handle

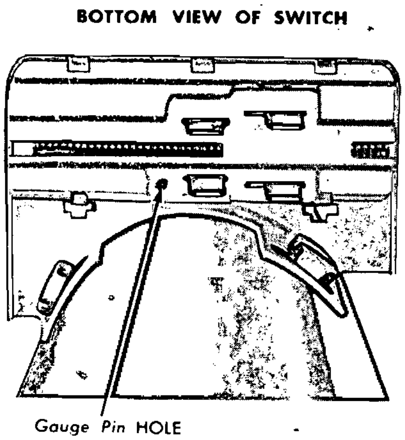


FIG. 20—Typical Starter Neutral Switch-Column Shift

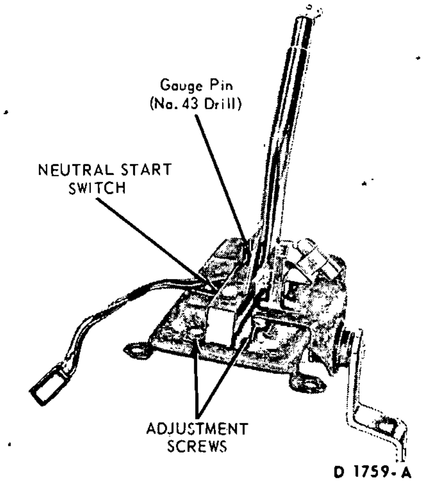


FIG. 21—Starter Neutral Switch—Console Shift

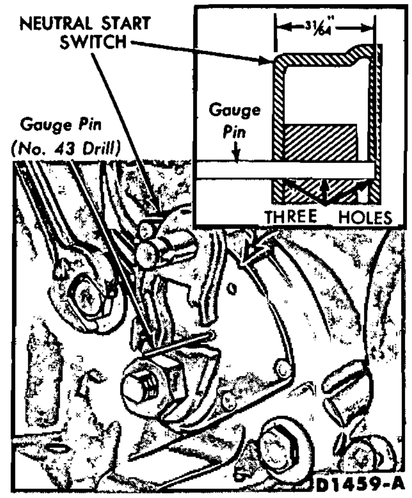


FIG. 22—Neutral Start Switch-Mustang -Cougar

and tighten the attaching screw.

18. Position the selector lever in the D position.

19. Raise the car. Install the transmission manual lever rod to the selector lever. Adjust the manual linkage.

20. Lower the car and check the transmission operation in each selector lever detent position.

NEUTRAL START SWITCH ADJUSTMENT

COMET AND FAIRLANE

Column Shift

1. With the manual linkage properly adjusted, check the starter engagement circuit in all transmission selector lever positions. The circuit must be open in all drive positions and closed only in park and neutral. The starter should engage only in park or neutral.

2. To adjust the switch, loosen the retaining screws that locate the switch on the steering column (Fig. 20).

3. Place the transmission selector lever firmly against the stop of the neutral detent position.

4. Rotate the switch actuating lever until the gauge pin (No.43 drill) can be inserted into the gauge pin holes (Fig. 20).

5. Tighten the two switch retaining screws and remove the gauge pin.

6. Check the operation of the switch in each selector lever position. The starter should engage in only the neutral and park detent positions. Whenever the manual linkage is adjusted, the starter neutral switch should be checked and if necessary adjusted.

Console Shift

1. With the manual linkage properly adjusted, check the starter engagement circuit in all positions. The circuit must be open in all drive positions and closed only in park and neutral.

2. Remove the selector lever handle from the lever.

3. Remove the trim panel from the top of the console.

4. Remove the cover and dial indicator as an assembly.

5. Remove the six screws that secure the selector lever retainer to the selector lever housing. Lift the retainer from the housing.

6. Loosen the two combination starter neutral and back-up light switch attaching screws (Fig. 21).

7. Move the selector lever back and forth until the gauge pin (No. 43 drill) can be fully inserted into the gauge pin holes (Fig. 21).

8. Place the transmission selector lever firmly against the stop of the neutral detent position.

9. Slide the combination starter neutral and back-up light switch forward or rearward as required, until the switch actuating lever contacts the selector lever.

10. Tighten the switch attaching screws and remove the gauge pin. Check for starting in the park position.

11. Turn the ignition key to the ACC position and place the selector lever in the reverse position and check the operation of the back-up lights. Turn the key off.

12. Position the selector lever retainer to the selector lever housing. Install the six attaching screws.

13. Install the cover and dial indicator.

14. Install the trim panel on the top of the console. Install the selector lever handle.

MUSTANG—COUGAR

1. With the manual lever properly adjusted, loosen the two switch attaching bolts (Fig. 22).

2. With the transmission manual lever in neutral, rotate the switch and insert the gauge pin (No. 43 drill shank end) into the gauge pin holes of the switch. The gauge pin has to be inserted to a full 31/64 inch into the three holes of the switch (Fig. 22).

3. Torque the two switch attaching bolts to specification. Remove the gauge pin from the switch.

4. Check the operation of the switch. The engine should start only with the transmission selector lever in Neutral and Park.

NEUTRAL START SWITCH REPLACEMENT

COMET AND FAIRLANE

Column Shift

1. Disconnect the neutral start switch wires at the plug connector.

2. Remove the two screws securing the neutral start switch to the steering column and remove the switch.

3. Position the neutral start switch on the steering column and install the two attaching screws.

4. With the transmission selector lever in neutral, rotate the switch

and install gauge pin (No. 43 drill) into the gauge pin hole (Fig. 20).

5. Tighten the switch attaching screws and remove the gauge pin.

6. Connect the switch wires to the plug connector.

7. Check the operation of the switch in each selector lever position. The starter should engage in only the neutral and park detent positions.

Console Shift

1. Remove the selector lever handle from the lever.
2. Remove the trim panel from the top of the console.
3. Remove the cover and dial indicator as an assembly.
4. Remove the six screws that secure the selector lever retainer to the selector lever housing. Lift the retainer from the housing.
5. Remove the two screws securing the neutral start switch to the selector lever housing. Disconnect the neutral start switch wires at the plug connector and remove the switch.
6. Position the neutral start switch to the selector lever housing and install the two attaching screws.
7. With the selector lever in neutral, move the selector lever back and forth until the gauge pin (No. 43 drill) can be fully inserted into the gauge pin holes (Fig. 21).
8. Place the transmission selector lever firmly against the stop of the neutral detent position.
9. Slide the combination starter neutral and back-up light switch forward or rearward as required, until the switch actuating lever contacts the selector lever.
10. Tighten the switch attaching screws and remove the gauge pin.
11. Connect the neutral start switch wires to the plug connector and check for starting in the park position.
12. Position the selector lever retainer to the selector lever housing. Install the attaching screws.
13. Install the cover and dial indicator.
14. Install the trim panel on the top of the console. Install the selector lever handle.

MUSTANG—COUGAR

1. Remove the downshift linkage rod from the transmission downshift lever.
2. Apply penetrating oil to the downshift lever shaft and nut. Remove the transmission downshift outer lever retaining nut and lever (Fig. 22).
3. Remove the two neutral start switch attaching bolts.
4. Disconnect the two multiple wire connectors. Remove the neutral switch from the transmission.
5. Install the neutral start switch on the transmission. Install the two attaching bolts.
6. With the transmission manual lever in neutral, rotate the switch and install guage pin (No. 43 drill) into the gauge pin hole (Fig. 22).
7. Tighten the switch attaching bolts to specification and remove the gauge pin.
8. Install the outer downshift lever and attaching nut, and torque the nut to specification. Install the downshift linkage rod to the downshift lever.
9. Install the switch wires. Connect the wire multiple connectors, red to red and blue to blue. Check the operation of the switch in each detent position. The engine should start only with the transmission selector lever in N (neutral) and P (park).

BAND ADJUSTMENT INTERMEDIATE BAND

1. Raise the car on a hoist or jack stands.
2. Clean the threads of the intermediate band adjustment screw.
3. Remove and discard the lock nut.
4. Install a new lock nut and tighten the adjusting screw to 10 ft-lbs. torque (Fig. 23).
5. Back off the adjusting screw exactly 1 full turn.
6. Hold the adjusting screw from turning and torque the lock nut to specification.
7. Lower the car.

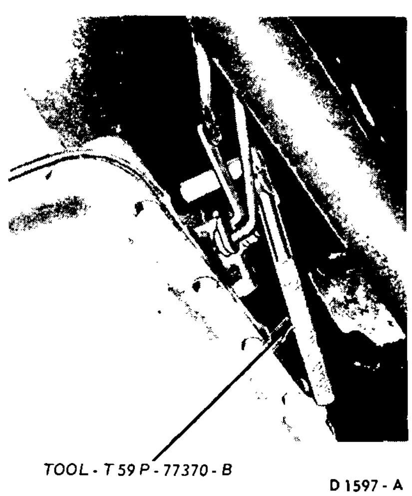


FIG. 23—Adjusting Intermediate Band

OIL PAN AND CONTROL VALVE BODY REPLACEMENT

1. Raise car on a hoist or jack stands.
2. Place a drain pan under the transmission. Loosen and remove all but two of the oil pan bolts from the front of the case and drop the rear edge of the oil pan to drain the fluid. Remove and thoroughly clean the oil pan and screen. Discard the oil pan gasket.
3. Remove the valve body attaching bolts and remove the valve body from the case.
4. Position the valve body to case making sure that the selector and downshift lever are engaged, then install and torque the attaching bolts to specification.
5. Clean the oil pan and gasket surfaces thoroughly.
6. Using a new pan gasket, secure the pan to the transmission case and torque the attaching bolts to specification.
7. Lower the car and fill the transmission to the correct level with the specified fluid.

INTERMEDIATE SERVO REPAIR

REMOVAL

1. Raise the car on a hoist or stands.
2. Remove the engine rear support-to-extension housing attaching bolts.
3. Raise the transmission high enough to remove the weight from the engine rear support.
4. Remove the bolt that secures the engine rear support to the crossmember. Remove the support.
5. Lower the transmission and remove the jack.
6. Place a drain pan beneath the servo. Remove the bolts that attach the servo cover to the transmission case. Loosen the band adjusting screw lock nut.
7. Remove the cover, piston, spring and gasket from the case, screwing the band adjusting screw inwards as the piston is removed. This insures that there will be enough tension on the band to keep the struts properly engaged in the band end notches while the piston is removed.

SEAL REPLACEMENT

1. Apply air pressure to the port in the servo cover to remove the piston and stem.
2. Remove the seals from the piston (Fig. 24).

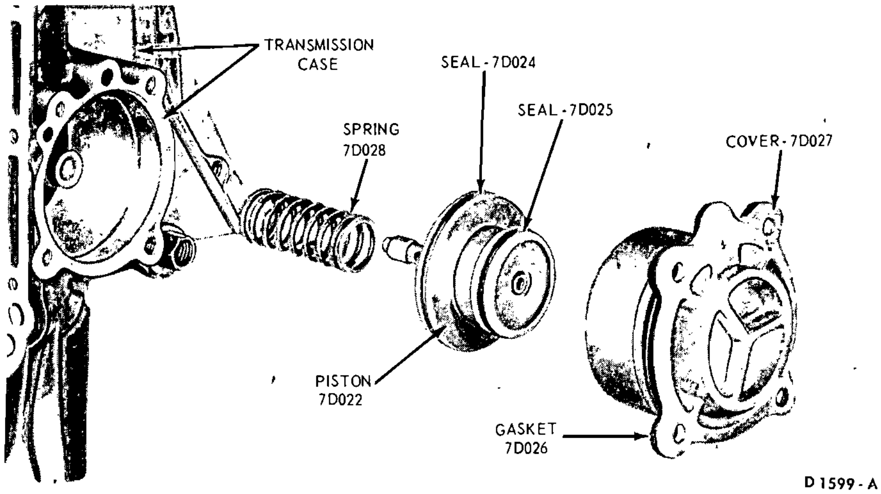


FIG. 24—Servo Disassembled

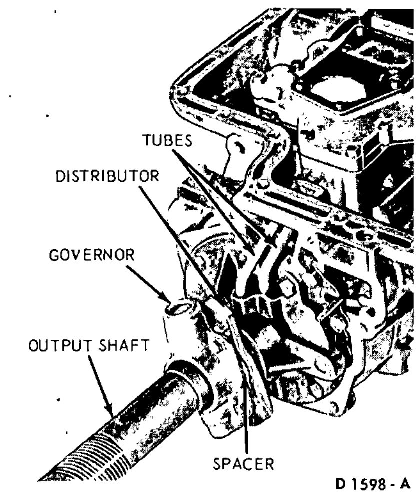


FIG. 25—Governor Installed

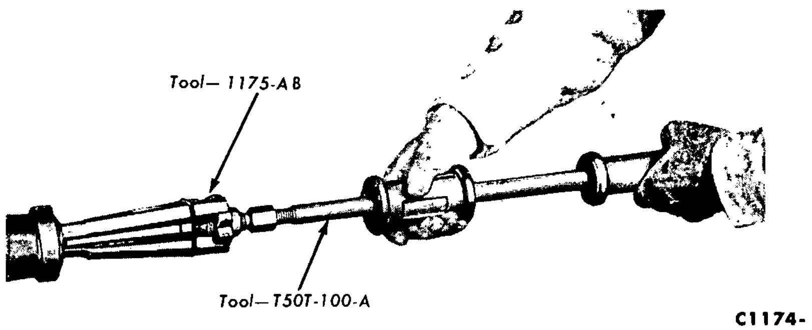


FIG. 26—Removing Extension Housing Seal

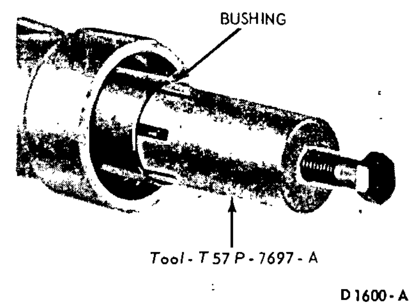


FIG. 27—Removing Extension Housing Bushing

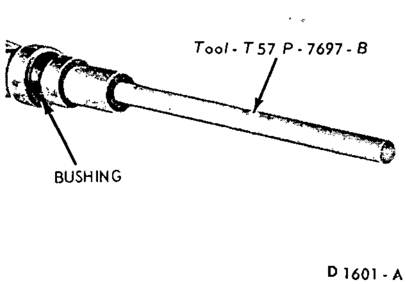


FIG. 28—Installing Extension Housing Bushing

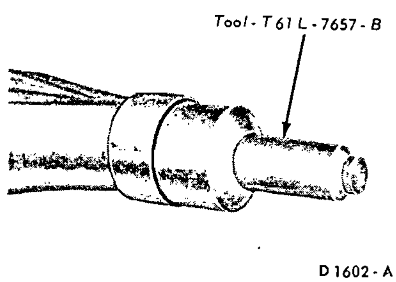


FIG. 29—Installing Extension Housing Seal

3. Remove the seal from the cover.

4. Dip the new seals in transmission fluid.

5. Install the new seals on the piston.

6. Install the new seal on the cover.

7. Dip the piston in transmission fluid and install it in the cover.

INSTALLATION

1. Position a new gasket on the servo cover.

2. Position the servo spring on the piston stem.

3. Insert the servo piston stem in the case. Secure the cover with the attaching bolts, taking care to back off the band adjusting screw while tightening the cover bolts. Make sure that the vent tube retaining clip and service identification tag are in place.

4. Raise the transmission high enough to install the engine rear support. Secure the support to the extension housing with the attaching bolts. Lower the transmission as required to install the support to crossmember attaching bolt. Torque the attaching bolts to specification.

5. Remove the jack.

6. Adjust the band as detailed in Section 2.

7. Lower the car and replenish the fluid as required.

EXTENSION HOUSING AND GOVERNOR REPLACEMENT

1. Raise the car on a hoist or jack stands.

2. Place a large drain pan under the transmission. Loosen the drain pan attaching bolts and allow the fluid to drain. Starting at the rear of the pan, gradually remove all bolts but two and allow the fluid to drain further. After the fluid has drained, install two bolts loosely in the rear side of the pan.

3. Disconnect the parking brake cable from the equalizer.

4. Remove the torque plate attaching bolts and remove the plate.

5. Disconnect the driveshaft from the rear axle flange and remove it

from the transmisssion.

6. Disconnect the speedometer cable from the extension housing.

7. Remove the two nuts that secure the engine rear mount to the crossmember.

8. Place a jack under the transmission and raise it just enough to remove the weight from the crossmember.

9. Remove the cotter pins and nuts that attach the crossmember to the frame side supports. Remove the crossmember.

10. Remove the engine rear support-to-extension housing attaching bolts and remove the support.

11. Lower the transmission to permit access to the extension housing attaching bolts.

12. Remove the extension housing attaching bolts and slide the housing off the output shaft.

13. Remove the four bolts that attach the governor to the distributor (Fig. 25). Slide the governor off the output shaft.

14. Secure the governor (Fig. 25) to the distributor flange with the attaching bolts. Torque the bolts to specification.

15. Clean the mounting surface on the transmission and on the extension housing. Position a new gasket on the transmission.

16. Hold the extension housing in place and secure it with the attaching bolts.

17. Raise the transmission high enough to position the engine rear support and the crossmember.

18. Secure the engine rear support to the crossmember with the attaching bolts. Torque the nuts to specification.

19. Position the crossmember on the frame side supports. Install the attaching nuts and torque them to specification. Secure the nuts with cotter pins.

20. Lower the transmission and remove the jack. Install and torque the engine rear support-to-extension housing attaching bolts to specification.

21. Secure the speedometer cable to the extension housing with the attaching bolt.

22. Connect the parking brake to the equalizer.

23. Install the drive shaft.

24. Secure the torque plate to the floor pan with the attaching bolts. Torque them to specification.

25. Fill the transmission to the correct level with the specified fluid.

EXTENSION HOUSING BUSHING AND REAR SEAL REPLACEMENT

1. Disconnect the drive shaft from the transmission.

2. When only the rear seal needs replacing, carefully remove it with a tapered chisel or the tools shown in Fig. 26. Remove the bushing as shown in Fig. 27. **Use the bushing remover carefully so that the spline seal is not damaged.**

3. When installing a new bushing use the special tool shown in Fig. 28.

4. Before installing a new seal, inspect the sealing surface of the universal joint yoke for scores. If scores are found, replace the yoke.

5. Inspect the counterbore of the housing for burrs with crocus cloth.

6. Install the seal into the housing with the tool shown in Fig. 29. The seal should be firmly seated in the bore. Coat the inside diameter of the fiber portion of the seal with B8A-19589-A lubricant.

7. Coat the front universal joint spline with B8A-19589-A lubricant and install the drive shaft.

3 REMOVAL AND INSTALLATION

REMOVAL

1. On Mustang and Cougar, disconnect the neutral switch wires from the harness connector and the retaining clip on the dash.

2. Remove the bolt that secures the filler tube to the rear of the right cylinder head.

3. Raise the car on a hoist or jack stands.

4. Remove the converter drain plug access cover from the lower end of the converter housing.

5. Place a drain pan under the converter housing and remove the two converter drain plugs. Install the plugs after the fluid has drained.

6. Place the drain pan under the transmission oil pan. Starting at the rear of the pan and working toward the front, loosen the attaching bolts and allow the fluid to drain. Finally remove all of the pan attaching bolts except two at the front, to allow the oil to further drain. After the oil has drained, install two bolts on the rear side of the pan to temporarily hold it in place.

7. Disconnect the drive shaft from the rear axle flange and remove it from the transmission. Install tool T61L-7657-A in the rear of the extension housing to prevent the fluid from leaking.

8. Disconnect the downshift rod from the transmission downshift lever.

9. Disconnect the shift rod from the manual lever.

10. Disconnect the speedometer cable from the extension housing.

11. Disconnect the rubber hose from the vacuum diaphragm at the rear of the transmission. Remove the vacuum tube from the retaining clip at the transmission.

12. Disconnect the starter cable from the terminal on the starter. Remove the starter attaching bolts and remove it from the housing.

13. Lift the fluid filler tube from the transmission case.

14. Remove the four converter-to-flywheel attaching nuts.

15. On a Mustang or Cougar, disconnect the complete exhaust system and allow it to hang on the rear axle.

16. Remove the two nuts that attach the engine rear support to the crossmember.

17. Raise the transmission with a jack just enough to remove the weight from the crossmember.

18. Remove the cotter pins from the crossmember-to-frame side support attaching nuts and remove the nuts. Lift the crossmember from the frame side supports.

19. Remove the bolts that attach the engine rear support to the extension housing and remove the support.

20. Lower the transmission, then disconnect the fluid cooler lines from the transmission case.

21. Secure the transmission to the jack with a chain.

22. Remove the six bolts that attach the converter housing to the cylinder block.

23. Move the jack rearward until the transmission clears the engine, then tip it forward to provide clearance. Lower the transmission and remove it from under the car.

24. Remove the converter from

the transmission. Mount the transmission in a holding fixture if repairs are necessary.

INSTALLATION

1. Mount the transmission in a transmission jack and secure it with a safety chain.
2. Install the converter on the front pump.
3. Rotate the flywheel so that the drain plug holes are in a vertical position. Rotate the converter so that the drain plugs are in the same relative position as the drain plug holes in the flywheel.
4. Roll the transmission into position under the car and raise it to alignment with the engine. Move it forward until the converter housing contacts the cylinder block. Install and torque the converter-to-cylinder block attaching bolts.
5. Remove the jack safety chain from the transmission.
6. Connect the two fluid cooler lines to the fittings in the transmission case.
7. Secure the engine rear support to the extension housing with the attaching bolts. Torque the bolts to specification.
8. Position the crossmember on the frame side supports and install and tighten the attaching nuts to specification. Install cotter pins to retain the nuts.
9. Remove the transmission jack from under the car. Install and torque the engine rear support-to-crossmember attaching nuts.
10. Install the exhaust system on Mustang and Cougar.
11. Install the converter-to-flywheel attaching nuts and torque them to specifications. Tighten the drain plugs to specification.
12. Secure the converter drain plug access cover to the lower end of the converter housing with the attaching bolts.
13. Install a new O-ring on the lower end of the fluid filler tube. Dip the O-ring in clean automatic transmission fluid and insert the filler tube in the transmission case.
14. Secure the starter to the converter housing. Connect the cable to the terminal on the starter.
15. Connect the speedometer cable to the extension housing.
16. Connect the shift rod to the manual lever at the transmission.
17. Connect the downshift rod to the lever on the transmission. Adjust the rod. Part 7-2 if required.
18. Remove the tool from the extension housing and install the drive shaft.
19. Lower the car.
20. Working from the engine compartment, secure the fluid filler tube to the rear of the right cylinder head with the attaching bolt.
21. On Mustang and Cougar, connect the neutral switch wires to the harness. Secure the wires to the dash with the retaining clip.
22. Fill the transmission with the specified lubricant as detailed in Part 7-1.

4 MAJOR REPAIR OPERATIONS

DISASSEMBLY OF TRANSMISSION

1. Mount the transmission in holding fixture T59P-7000-A (Fig. 30).
2. Remove the oil pan attaching bolts. Remove the pan and gasket.
3. Remove the valve body attaching bolts (Fig. 31). Lift the valve body from the transmission case.
4. Attach a dial indicator to the front pump as shown in Fig. 32. Install tool T61L-7657-B in the extension housing to center the shaft.
5. Pry the gear train to the rear of the case and at the same time, press the input shaft inward until it bottoms (Fig. 32). Set the dial indicator to read zero.
6. Pry the gear train forward (Fig. 32) and note the amount of gear train end play, on the dial indicator. Record the end play to facilitate assembling the transmission. Remove the dial indicator from the pump and the tool from the extension housing.
7. Remove the vacuum diaphragm, rod and the primary throttle valve from the case.
8. Slip the input shaft out of the front pump.
9. Remove the front pump attaching bolts. Pry the gear train forward as shown in Fig. 33 to remove the pump.

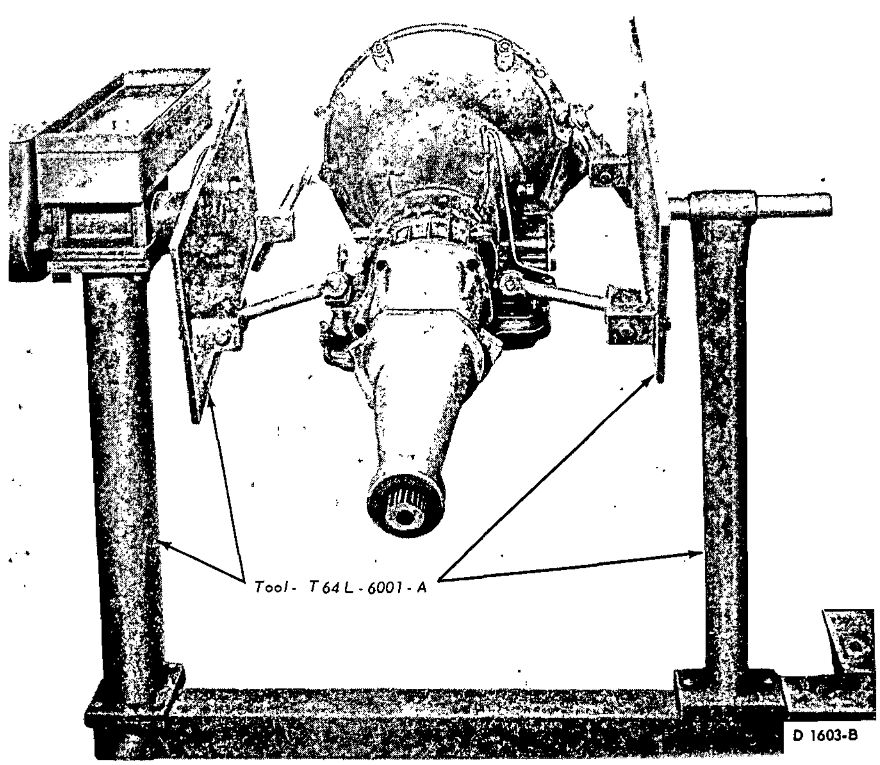


FIG. 30—Transmission Mounted in Holding Fixture

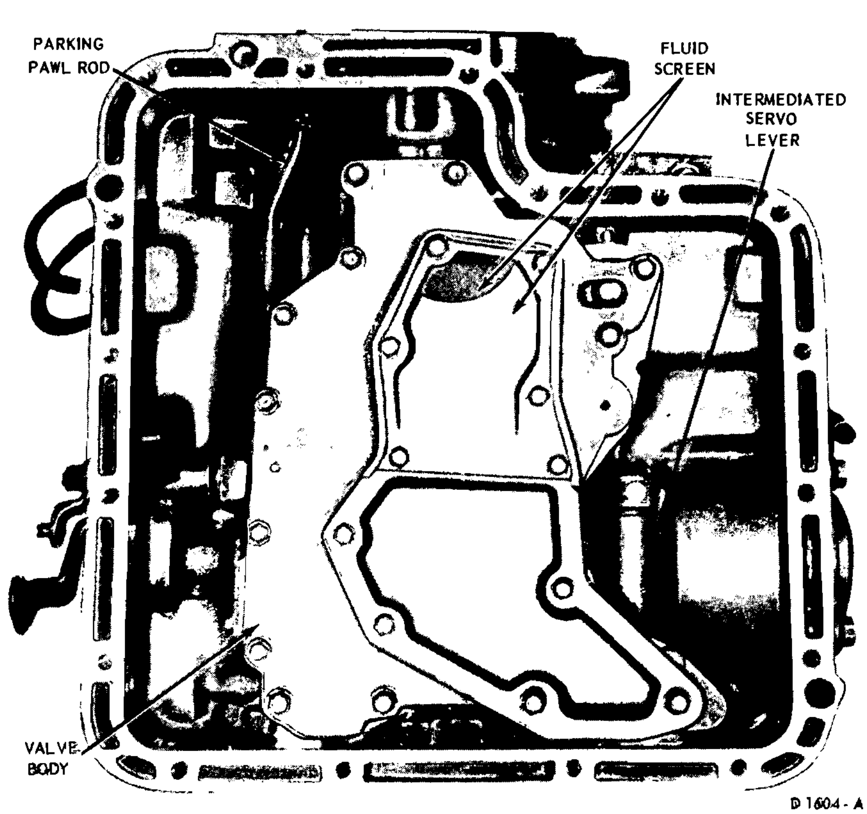


FIG. 31—Transmission with Oil Pan Removed

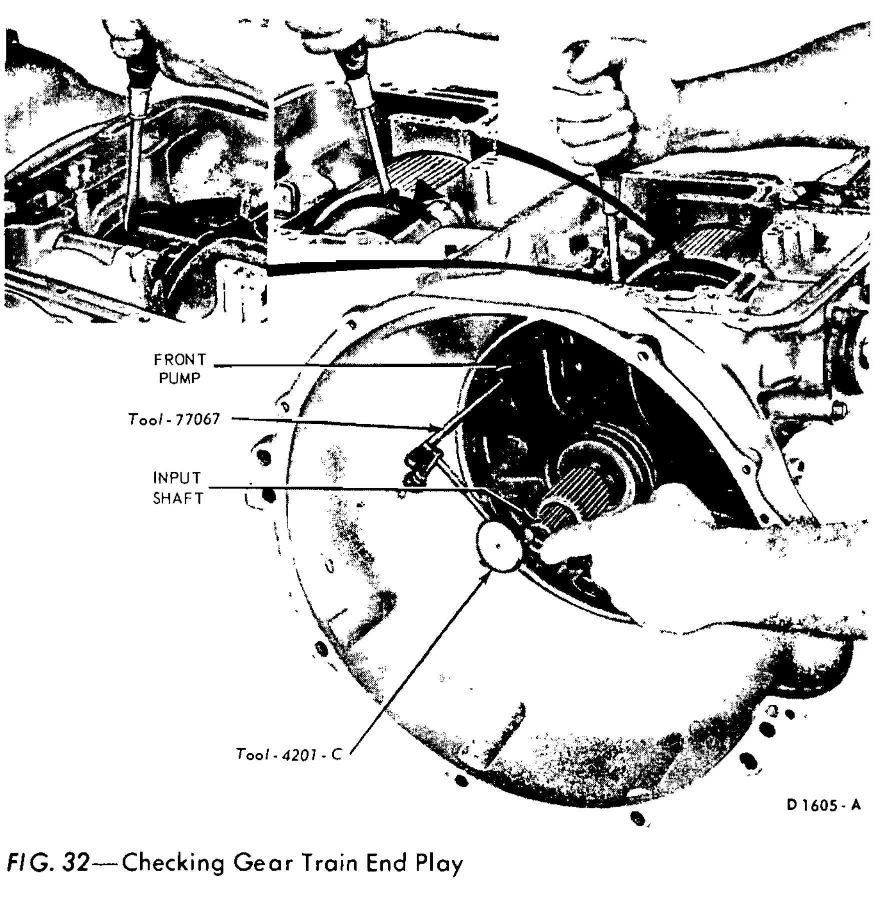


FIG. 32—Checking Gear Train End Play

10. Loosen the band adjustment screw and remove the two struts.

11. Rotate the band 90° counter-clockwise to align the ends with the slot in the case (Fig. 34). Slide the band off the direct drive clutch drum.

12. Remove the forward part of the gear train as an assembly as shown in Fig. 35.

13. Remove the large snap ring that secures the reverse planet carrier in the low-reverse clutch hub. Lift the planet carrier from the drum.

14. Remove the snap ring (Fig. 36) that secures the reverse ring gear and hub on the output shaft. Slide the ring gear and hub off the shaft.

15. Rotate the low-reverse clutch hub in a clockwise direction and at the same time, withdraw it from the case.

16. Remove the reverse clutch snap ring from the case, then remove the clutch discs, plates and pressure plate from the case.

17. Remove the extension housing attaching bolts. Remove the extension housing and gasket.

18. Slide the output shaft assembly from the transmission case.

19. Remove the distributor sleeve attaching bolts and remove the sleeve, parking pawl gear and the thrust washer.

20. Compress the reverse clutch piston release spring with tool T65P-77515-A (Fig. 37). Remove the snap ring. Remove the tool and the spring retainer.

21. Remove the one-way clutch inner race attaching bolts from the rear of the case. Remove the inner race from inside of the case.

22. Remove the low-reverse clutch piston from the case as shown in Fig. 38.

PARTS REPAIR OR REPLACEMENT

During the repair of the subassemblies, certain general instructions which apply to all units of the transmission must be followed. Following these instructions will avoid unnecessary repetition.

All transmission parts must be handled carefully to avoid nicking or burring the bearing or mating surfaces.

Lubricate all internal parts of the transmission with clean automatic transmission fluid before assembling them.

Do not use any other lubricants except on gaskets and thrust washers. These may be coated with vaseline to facilitate assembly. Always

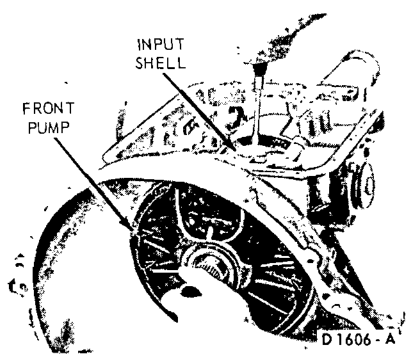


FIG. 33—Removing Front Pump

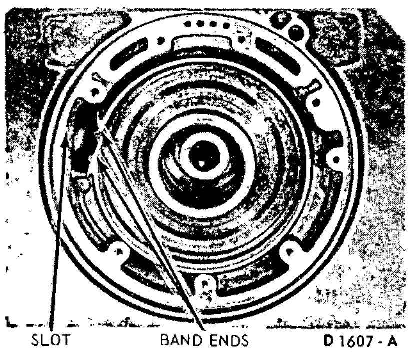


FIG. 34—Removing or Installing Band

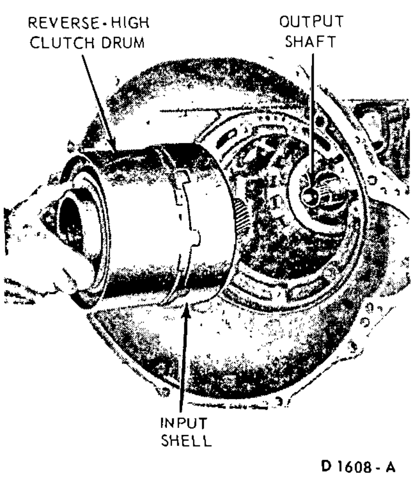


FIG. 35—Removing or Installing Forward Part of Gear Train

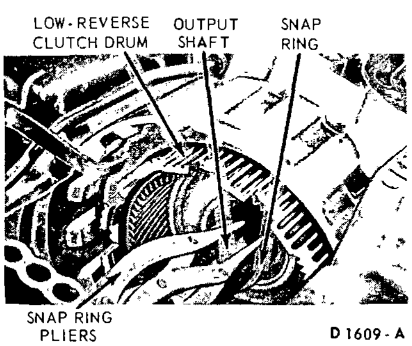


FIG. 36—Removing or Installing Reverse Ring Gear Hub Retaining Ring

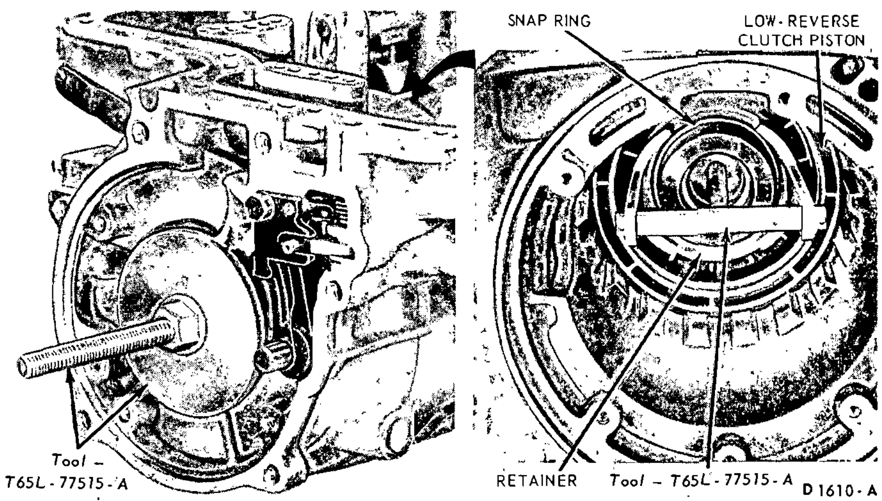


FIG. 37—Compressing Low-Reverse Clutch Springs

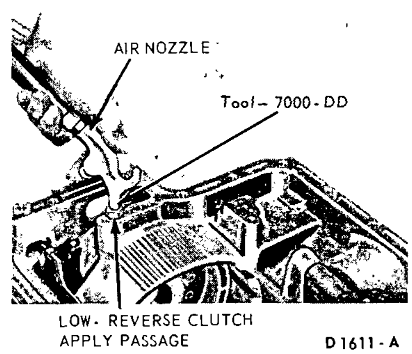


FIG. 38—Removing Low-Reverse Clutch Piston

use new gaskets and seals when assembling a transmission.

Tighten all bolts and screws to the recommended torque as outlined in the Specification Section.

TRANSMISSION CASE AND LINKAGE

Downshift and Manual Linkage

1. Remove the nut and lock washer that secures the outer downshift lever to the transmission and remove the lever.

2. On a Mustang or Cougar, remove the two bolts that secure the neutral safety switch to the case. Insert a screwdriver between the switch and case as close as possible to the shaft. Gently pry the switch from the case.

3. Slide the downshift lever out from the inside of the case (Fig. 39). Remove the seal from the recess in the manual lever shift.

4. Remove the C-ring that secures the parking pawl actuating rod to the manual lever. Remove the rod from the case.

5. Remove the nut that secures the inner manual lever to the shaft. Remove the inner lever from the shaft. Slide the outer lever and shaft from the case.

6. Remove the seal from the case with Tools T59L-100-B and T58L-101-A or 7600-E.

7. Dip the new seal in transmission fluid and install it in the case as shown in Fig. 40.

8. Slide the outer manual lever and shaft in the transmission case.

9. Position the inner lever on the shaft and install the attaching nut. Tighten the nut to specification. Install the parking pawl actuating rod and secure it to the inner manual lever with a C-washer.

10. Install a new downshift lever seal in the recess of the outer lever shaft. Slide the downshift lever and shaft into position.

11. On a Mustang or Cougar, position the neutral safety switch on the manual lever and secure it with the two attaching bolts. Leave the attaching bolts loose to adjust the switch after installing the control valve.

12. Place the outer downshift lever on the shaft and secure it with a lock washer and nut.

Parking Pawl Linkage

1. Remove the bolts that secure the parking pawl guide plate to the case (Fig. 41). Remove the plate.

2. Remove the spring, parking pawl and shaft from the case.

3. Working from the pan mounting surface, drill a 1/8 inch diameter hole through the center of the cupped plug. Pull the plug from the case with a wire hook.

4. Lift the end of the spring off the park plate pin to relieve the tension.

5. Thread a 1/4-20 inch or # 8-32 x 1 1/4 inch screw (Fig. 42)

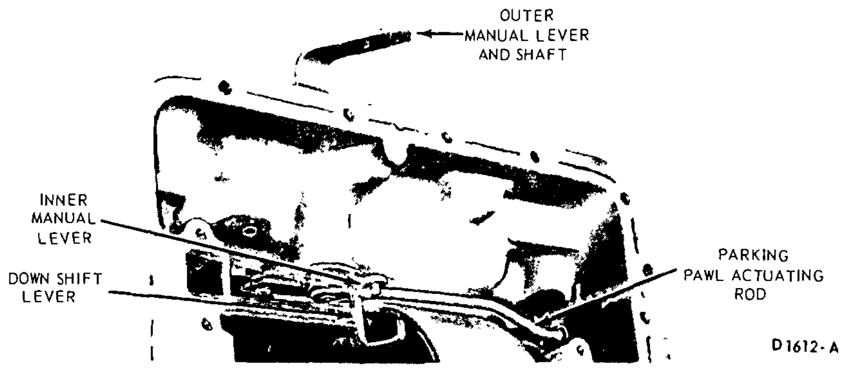


FIG. 39—Downshift and Manual Linkage

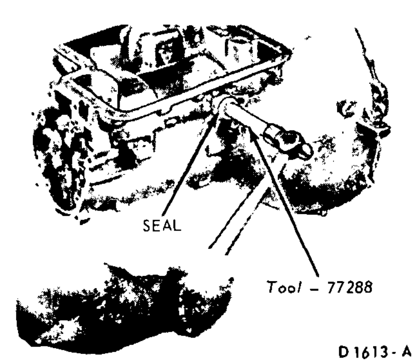


FIG. 40—Installing Manual Lever Seal

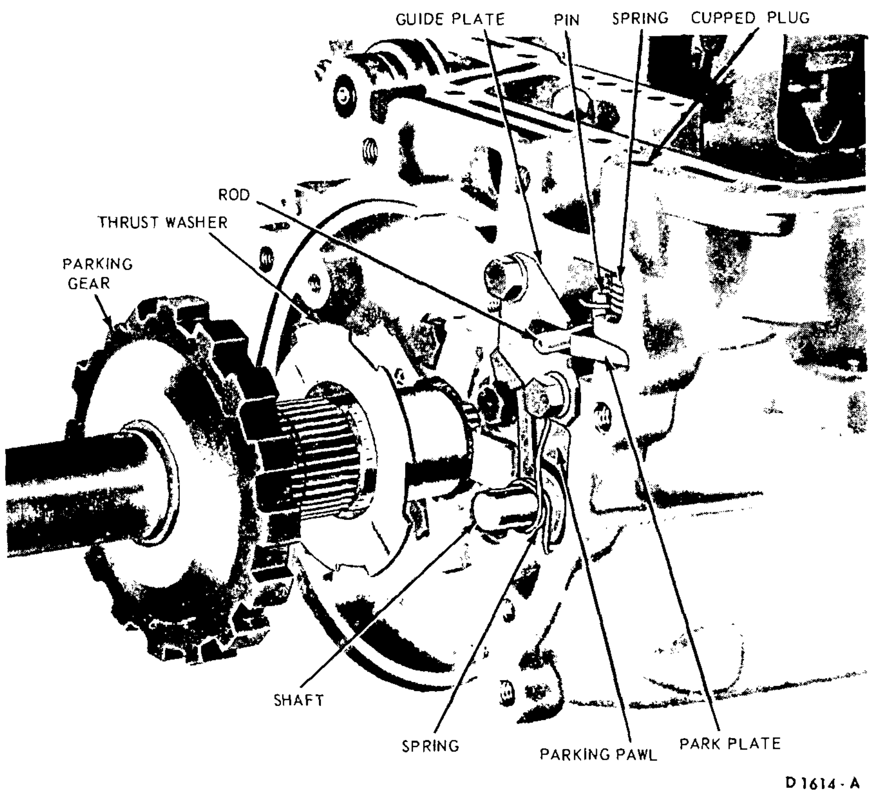


FIG. 41—Parking Pawl Mechanism

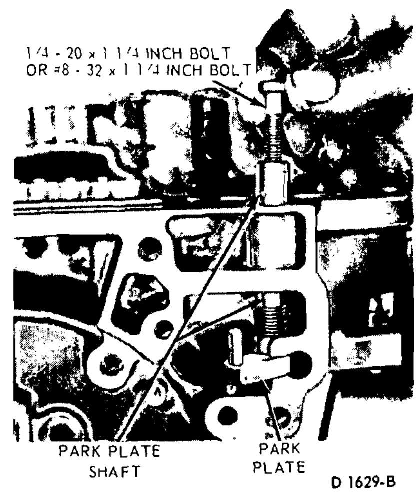


FIG. 42—Removing Park Plate Shaft

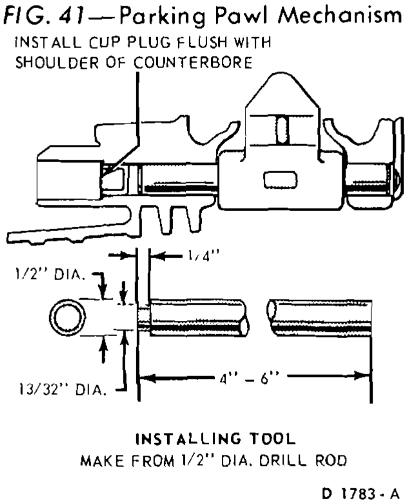


FIG. 43—Servo Apply Lever Installation

into the park plate shaft. Pull the shaft from the case with the screw.

6. Position the spring and park plate in the case and install the shaft. Hook the end of the spring over the pin on the park plate.

7. Install a new cupped washer (Fig. 41) to retain the shaft.

8. Install the parking pawl shaft in the case. Slip the parking pawl and spring into place on the shaft.

9. Position the guide plate on the case making sure that the actuating rod is seated in the slot of the plate. Secure the plate with two bolts and lock washers.

Servo Apply Lever

1. Working from inside of the transmission case, carefully drive on the servo apply lever shaft to remove the cup plug. The shaft (Fig. 43) can be withdrawn from the case by hand.

2. Hold the servo apply lever in position and install the new shaft.

3. Using the fabricated tool shown in Fig. 43, drive the cup plug into position in the case. Be sure the plug is flush with the shoulder of the counterbore.

Thread Repair Case

Thread service kits may be purchased from local jobbers or the Heli-Coil Corporation. To repair a damaged thread, the following procedures should be carefully followed.

1. Drill out the damaged threads **using the same size threads as the thread OD.** For example, use a 5/16-inch drill when repairing a 5/16-18 inch thread.

2. Select the proper **special** tap and tap the drilled hole. The tap is marked for the size of the thread being repaired. Thus, the special tap supplied with the repair kit marked 5/16-18 will not cut the same thread as a standard 5/16-inch tap. It will

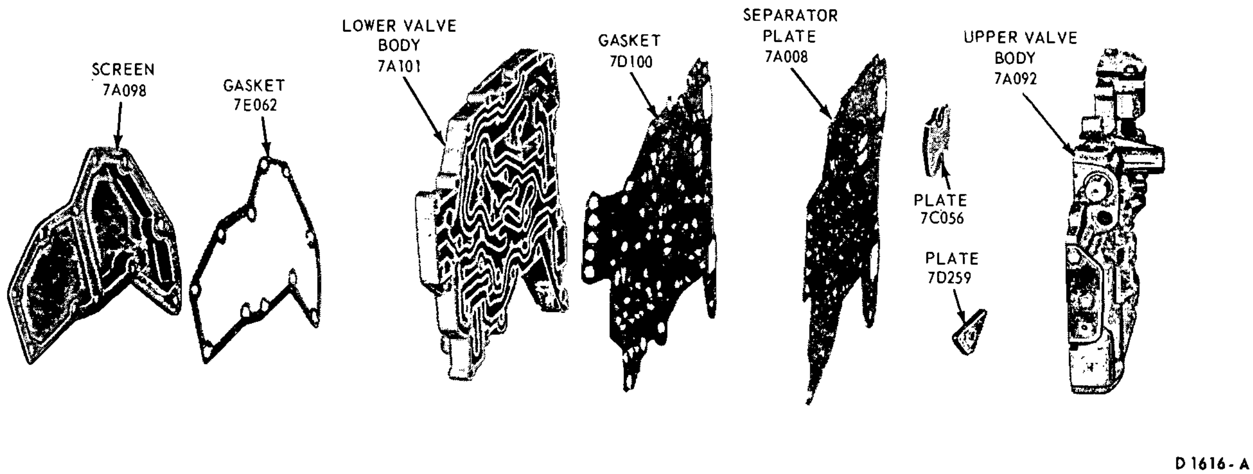


FIG. 44—Upper and Lower Valve Bodies Disassembled

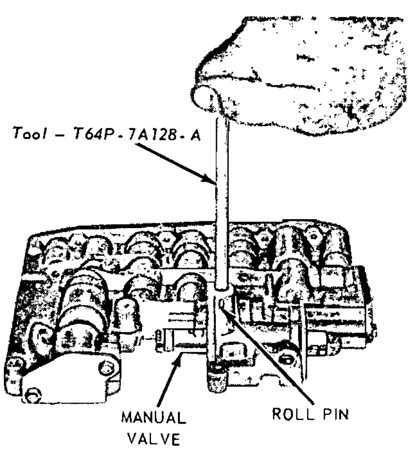


FIG. 45—Removing Manual Valve

cut a thread large enough to accommodate the insert, and after the insert is installed, the original thread size (5/16-16 inch) is restored.

3. Select the proper coil inserting tool. These tools are marked with the thread size being repaired. Place the insert on the tool and adjust the sleeve to the length of the insert being used.

Press the insert against the face of the tapped hole. Turn the tool clockwise and wind the insert into the hole until the insert is one half turn below the face.

4. Working through the insert, bend the insert tang straight up and down until it breaks off at the notch.

5. If the inserts are not properly installed, they can be removed with the extractor tool. Place the extractor tool in the insert so that the blade rests against the top coil 1/4-1/2 turn away from the end of the coil. Tap the tool sharply with a hammer so that the blade cuts into the insert. Exert downward pressure on the tool and turn it counterclockwise until the insert is removed.

CONTROL VALVE

Disassembly

1. Remove the nine screws that attach the screen to the lower valve body and remove the screen and gasket (Fig. 44).

2. Remove the twelve screws and the 2 plates that attach the two valve bodies.

3. Separate the bodies and remove the separator plate and gasket. Be careful not to lose the check valves and springs.

4. Depress the manual valve detent spring with the tool shown in Figure 45.

Remove the retaining pin from the upper valve body. Remove the spring and detent plunger.

5. Slide the manual valve (Fig. 46) out of the valve body.

6. Cover the downshift valve port with a finger, then working from the underside of the body remove the downshift valve retainer. Remove the spring and downshift valve.

7. Apply pressure on the pressure booster valve retaining plate and remove the two attaching screws. Slowly release the pressure and remove the plate, sleeve and the pressure booster valve. Remove the spring and the main regulator valve from the same bore.

8. Apply pressure on the throttle booster valve retaining plate and remove the two attaching screws. Slowly release the pressure and remove the plate, throttle booster valve and spring, and the manual ,low · 2-1 scheduling valve and spring from the body.

9. Apply pressure on the remaining valve retaining plate and remove the eight attaching screws.

10. Hold the valve body so that the plate is facing upward. Slowly release the pressure and remove the plate.

11. When removing the various valves from the control valve body, keep all ports covered with your fingers except the bore the valve is being removed from. Remove the spring and the intermediate servo modulator valve (Fig. 46) from the valve body.

12. Remove the intermediate servo accumulator valve and spring.

13. Remove the 2-3 back-out valve, and spring.

14. Remove the 2-3 shift valve, spring and the throttle modulator valve.

15. Remove the 1-2 shift valve, D2 shift valve and the spring from the valve body.

16. Remove the coasting boost valve, spring and the coasting regulator valve from the body.

17. Remove the cutback control valve.

18. Remove the 3-2 shift timing valve retainer and remove the plug.

19. Remove the 3-2 shift timing valve and spring to complete the disassembly of the control valve.

Assembly

1. Place the spring and the 3-2 shift timing valve in the valve body.

2. Place the 3-2 shift timing valve plug in the valve body and install the plug retainer.

3. Place the cutback control valve (Fig. 46) in the valve body.

4. Place the coasting regulator valve, spring and the coasting boost valve in the body.

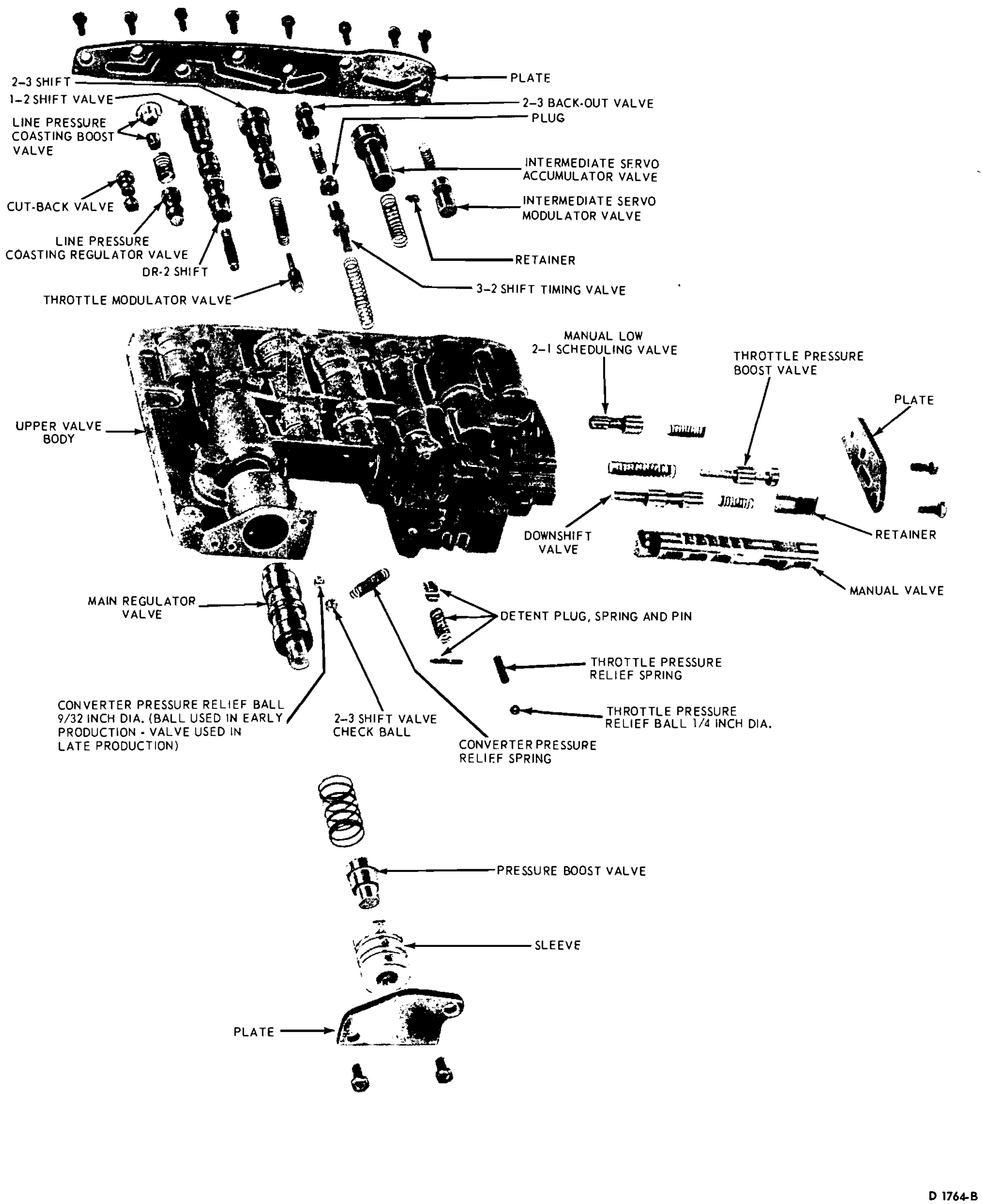


FIG. 46—Upper Valve Body Disassembled

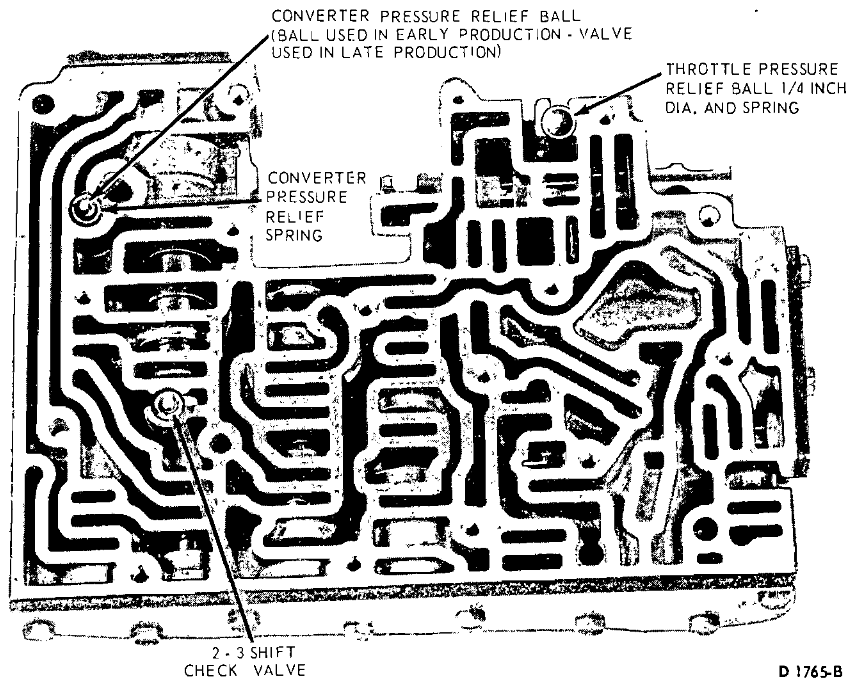


FIG. 47—Converter Pressure Relief Valve, Throttle Pressure Relief Valve, and 2-3 Shift Check Valve Locations

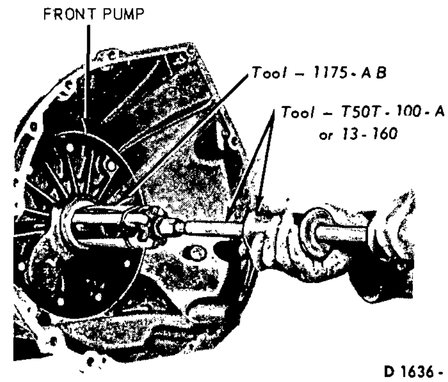


FIG. 48—Removing Front Pump Seal

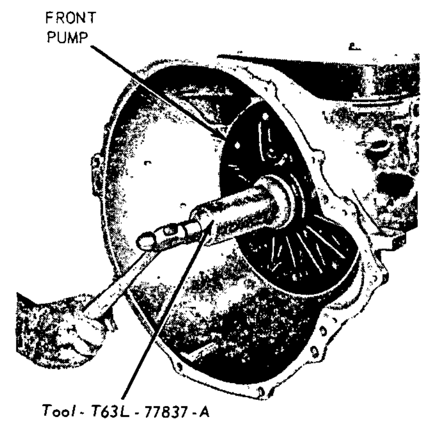


FIG. 49—Installing Front Pump Seal

5. Place the spring, D2 shift valve and the 1-2 shift valve in the body.

6. Place the throttle modulator valve and spring and the 2-3 shift valve in the valve body.

7. Place the spring and the 2-3 backout valve in the valve body.

8. Place the spring and intermediate servo accumulator valve in the valve body.

9. Place the intermediate servo modulator valve and spring in the body.

10. Carefully place the valve retaining plate on the body and secure it with the eight attaching screws. Tighten the screws to specification.

11. Place the throttle booster valve and spring in the valve body. Place the manual low 2-1 scheduling valve and spring in the valve body and install the retaining plate. Torque the attaching screws to specification.

12. Place the main regulator, two springs, pressure booster valve and the sleeve in the valve body.

13. Install the pressure booster plate and torque the two attaching screws to specification.

14. Place the downshift valve and spring in the valve body. Compress the spring and install the retainer from the underside of the body.

15. Place the manual valve in the valve body and install the detent plug, spring and the retaining pin in the body.

16. Place the valve body on a clean surface with the passage side facing up. Place the converter relief valve spring in its bore. (Fig. 47). Coat the converter relief valve check

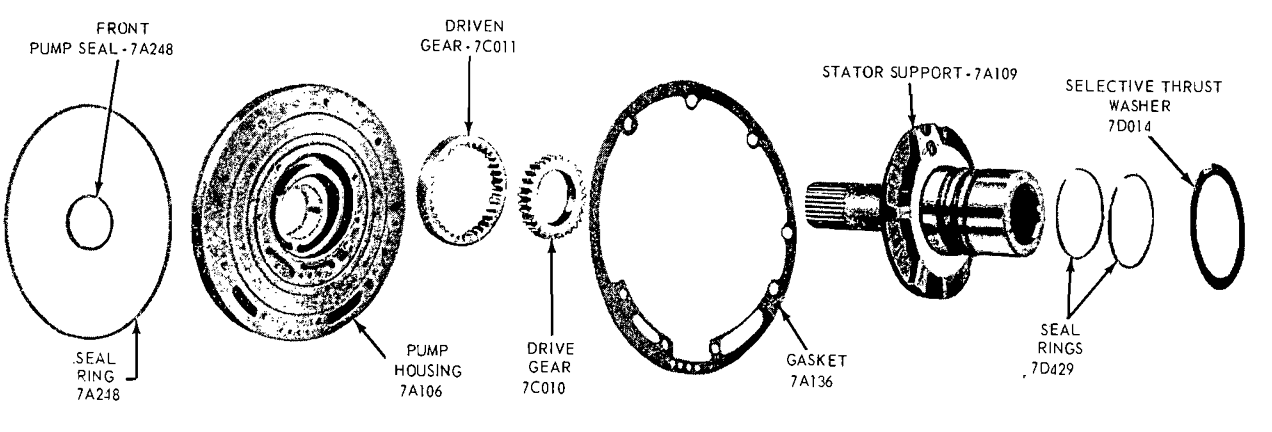
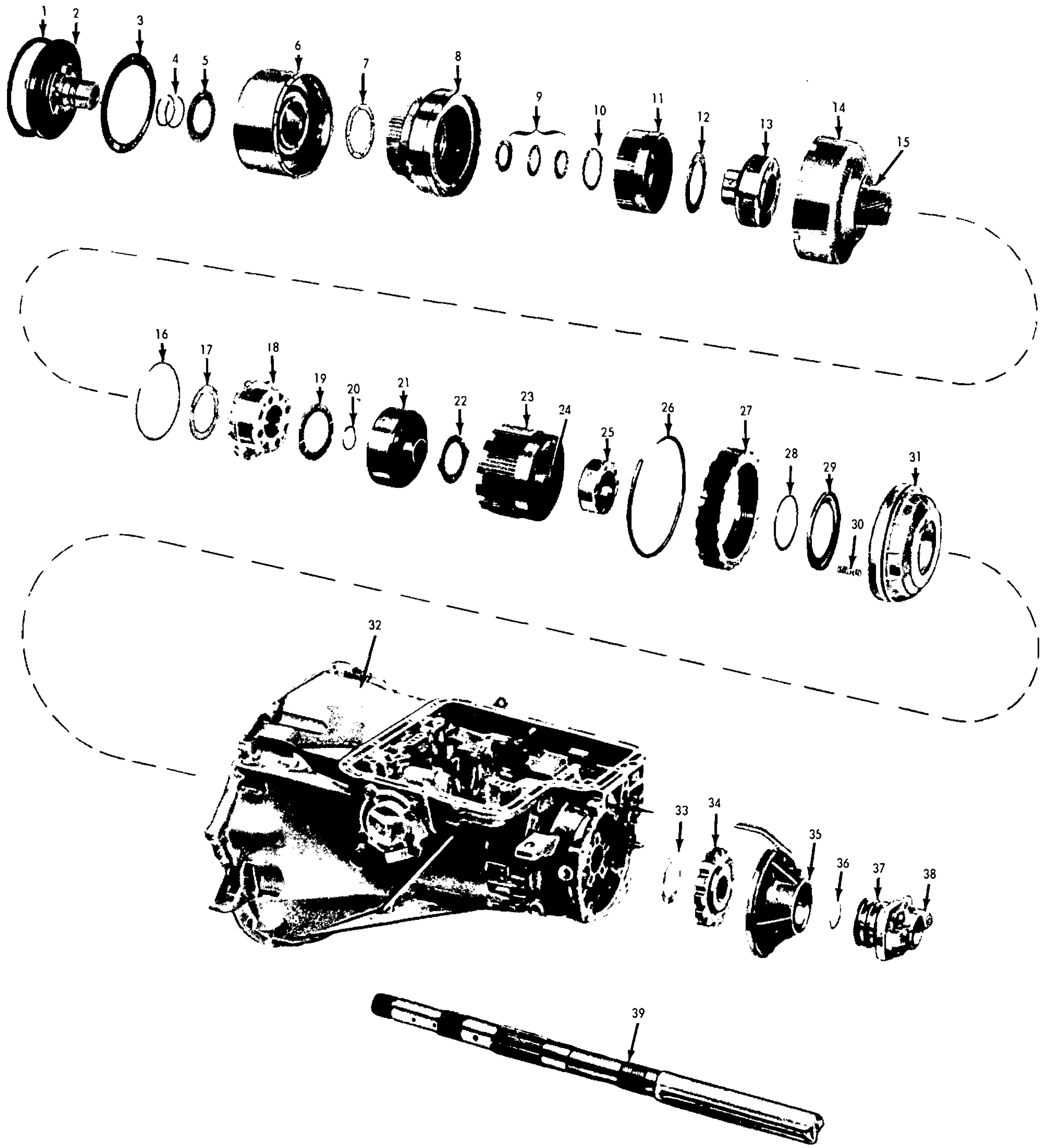


FIG. 50—Front Pump Disassembled



1. FRONT PUMP SEAL RING
2. FRONT PUMP
3. GASKET
4. SEAL
5. NUMBER 1 THRUST WASHER (SELECTIVE)
6. REVERSE–HIGH CLUTCH ASSEMBLY
7. NUMBER 2 THRUST WASHER
8. FORWARD CLUTCH ASSEMBLY
9. NUMBER 3 THRUST WASHER
10. NUMBER 4 THRUST WASHER
11. FORWARD CLUTCH HUB ASSEMBLY
12. NUMBER 5 THRUST WASHER
13. FORWARD PLANET ASSEMBLY
14. INPUT SHELL AND SUN GEAR ASSEMBLY
15. NUMBER 6 THRUST WASHER
16. SNAP RING
17. NUMBER 7 THRUST WASHER
18. REVERSE PLANET ASSEMBLY
19. NUMBER 8 THRUST WASHER
20. REVERSE RING GEAR AND HUB RETAINING RING
21. REVERSE RING GEAR AND HUB
22. NUMBER 9 THRUST WASHER
23. LOW–REVERSE CLUTCH HUB
24. ONE–WAY CLUTCH
25. ONE–WAY CLUTCH INNER RACE
26. SNAP RING
27. LOW–REVERSE CLUTCH
28. SNAP RING
29. LOW–REVERSE PISTON RETURN SPRING RETAINER
30. RETURN SPRING
31. LOW–REVERSE PISTON
32. CASE
33. NUMBER 10 THRUST WASHER
34. PARKING GEAR
35. GOVERNOR DISTRIBUTOR SLEEVE
36. SNAP RING
37. GOVERNOR DISTRIBUTOR
38. GOVERNOR
39. OUTPUT SHAFT

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FIG. 51—Drive Train Disassembled

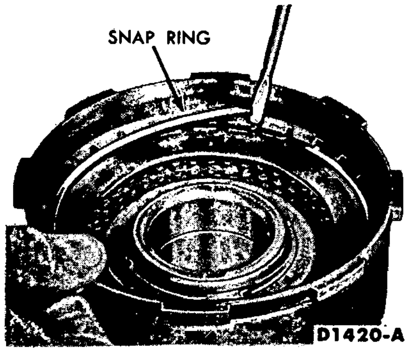


FIG. 52—Removing Reverse-High Pressure Plate Snap Ring

17. Carefully position the separator plate, new gasket and the lower valve body on the upper valve body and install and torque the attaching bolts to specification.

18. Secure the screen to the lower valve body with the attaching bolts and torque them to specification.

FRONT PUMP

The front seal can be replaced (Figs. 48 and 49) after the pump has been installed on the transmission.

Disassembly

1. Remove the two seal rings and the selective thrust washer (Fig. 50).

2. Remove the large square-cut seal from the O.D. of the pump housing.

3. Remove the five bolts that secure the pump support to the pump housing. Lift the support from the housing.

4. Remove the drive and the driven gear from the housing.

Assembly

1. Install the drive and driven gears in the pump housing. Each gear has an identification mark on one face. **The identification mark on each gear must be toward the front of the pump housing.**

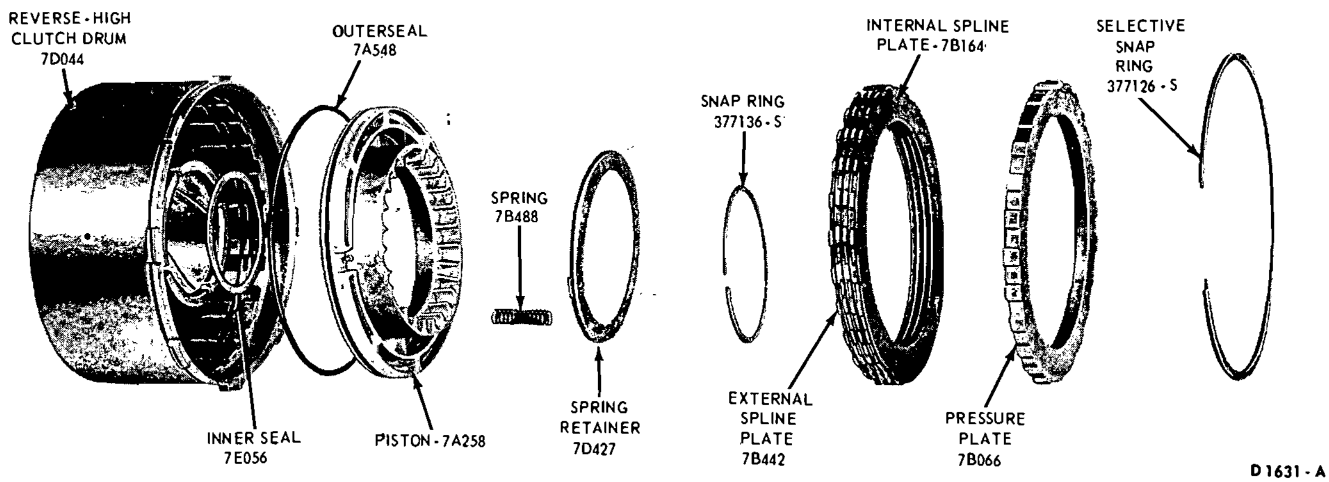


FIG. 53—Reverse-High Clutch Disassembled

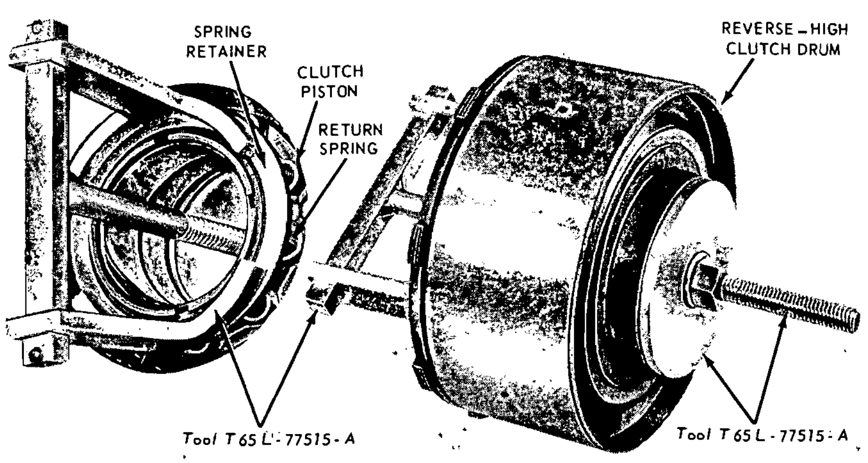


FIG. 54—Removing or Installing Snap Ring

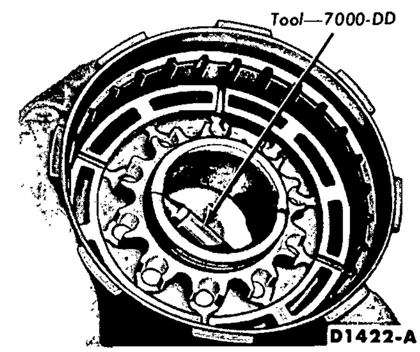


FIG. 55—Removing Reverse-High Clutch Piston

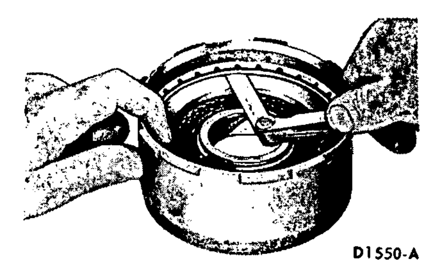


FIG. 56—Checking Reverse-High Clutch Snap Ring Clearance

ball or valve with vaseline and place it on top of the spring. Place the 2-3 shift check valve ball in its cavity. Place the throttle pressure relief valve spring in its bore (Fig. 47). Coat the throttle pressure relief valve check ball with vaseline and place it on top of the spring.

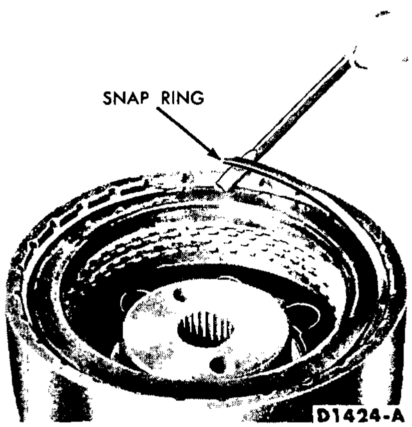


FIG. 57—Removing Forward Clutch Pressure Plate Snap Ring

2. Remove the pressure plate and the drive and driven clutch plates (Fig. 53).
3. Install Tool T65L-77515-A (Fig. 54) on the reverse-high clutch drum. Make sure that the legs clear the snap ring enough to permit expanding it enough for removing it. Remove the snap ring and remove the tool.
4. Remove the spring retainer and the piston return springs.
5. Apply air pressure to the piston apply hole in the clutch hub (Fig. 55) and remove the piston.
6. Remove the piston outer seal from the piston and the inner seal from the clutch drum (Fig. 53).
7. With a feeler gauge, check the clearance between the pressure plate and snap ring (Fig. 56).
8. The pressure plate should be held downward as the clearance is checked. The clearance should be 0.022-0.036. If the clearance is not within specifications, selective thickness snap rings are available in the following thicknesses: 0.054-0.060, 0.065-0.069, 0.074-0.078. Install the correct size snap ring and recheck the clearance.

FORWARD CLUTCH

Disassembly

1. Remove the clutch pressure plate retaining snap ring (Fig. 57).
2. Remove the rear pressure plate, the drive and driven plates and the forward pressure plate from the clutch hub (Fig. 58).
3. Remove the snap ring (Fig. 59) that secures the disc spring in the clutch cylinder. Remove the disc spring.
4. Apply air pressure to the clutch apply passage in the cylinder (Fig. 60) to remove the piston.
5. Remove the seal from the piston and the seal from the clutch hub (Fig. 58).

Assembly

1. Dip two new seals in transmission fluid. Install the smaller seal on the clutch hub and the other seal on the clutch piston.
2. Install the clutch piston in the cylinder.
3. Make sure that the steel pressure ring is in the groove on the piston. Position the disc spring in the cylinder with the convex face downward. Install the spring as shown in Fig. 59. Secure the disc with the retaining snap ring.

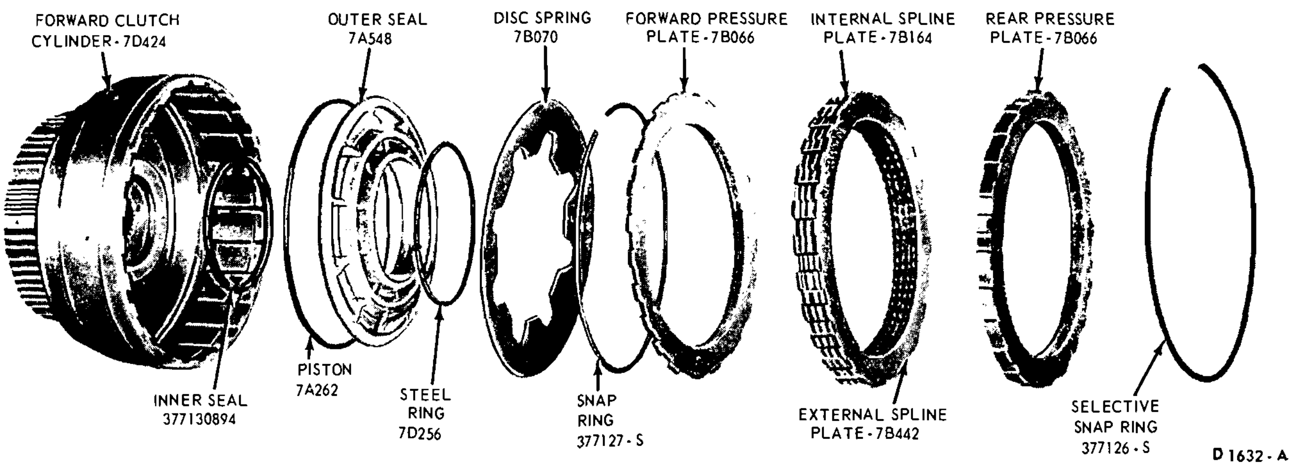


FIG. 58—Forward Clutch Disassembled

2. Position the pump support in the pump housing and install and torque the five attaching bolts to specification.
3. Carefully install two new seal rings on the pump support. Make sure that the ends of the rings are engaged to lock them in place. Install a new square-cut seal on the O.D. of the pump housing.
4. Install the selective thrust washer. Make sure that the correct thickness selective washer is being used to obtain the specified end play.
5. Place the pump on converter making sure that the drive gear engages the converter hub. Rotate the pump to make sure that the gears rotate freely.

REVERSE-HIGH CLUTCH

Disassembly

1. Separate the drive train as shown in Fig. 51. Remove the pressure plate retaining snap ring from the reverse-high clutch as shown in Fig. 52.

Assembly

1. Dip the new seals in transmission fluid and install one on the drum and one on the piston.
2. Install the piston in the clutch drum.
3. Position the piston return springs in the piston sockets. Place the spring retainer on the springs.
4. Install Tool T65L-77515-A (Fig. 54) and compress the springs. Make certain that the spring retainer is centered while compressing the springs. Install the snap ring. Before releasing the pressure on the tool, make certain that the snap ring is positioned inside of the four snap ring guides on the spring retainer.
5. Dip the clutch plates in clean transmission fluid. Install the clutch plates alternately starting with a steel drive plate and a composition plate (Fig. 53).
6. After all clutch plates have been installed, position the pressure plate in the clutch drum with the chamfered side facing up. Install the pressure plate snap ring.
7. With a feeler gauge, check the

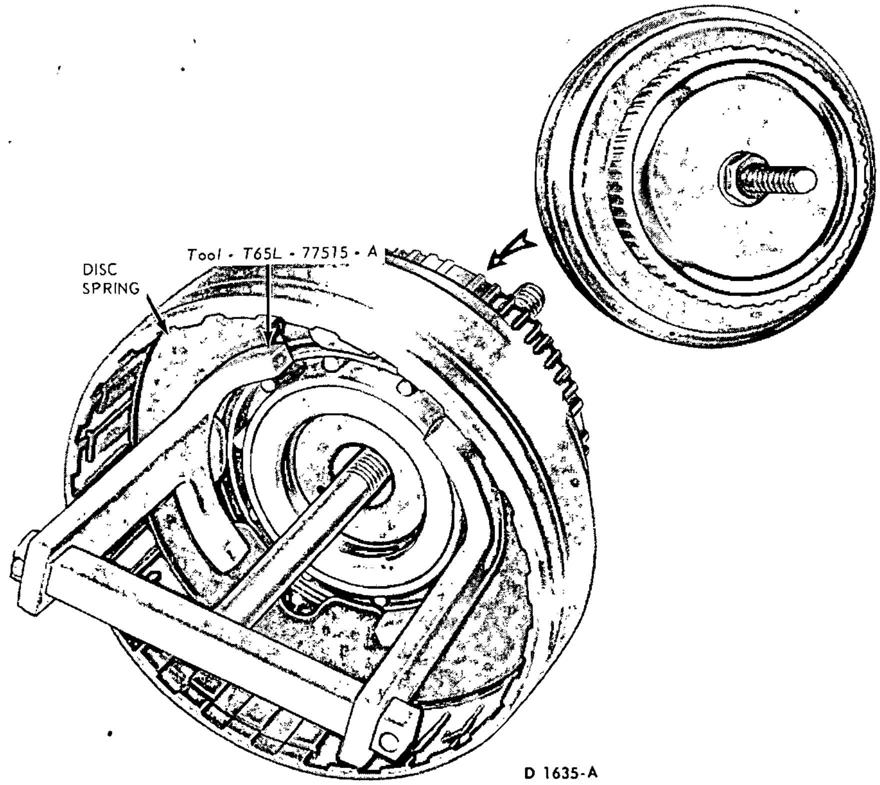


FIG. 59—Removing or Installing Disc Spring

4. Install the forward pressure plate with the flat side up and the beveled side downward. Install first a composition driven plate and a steel drive plate. Install the remaining plates in this sequence. The last plate installed will be the rear pressure plate with the internal chamfered side facing up (Fig. 58). Install the snap ring and make certain that it seats fully in the groove.

5. With a feeler gauge, check the clearance between the snap ring and the pressure plate (Fig. 61). Downward pressure on the plate should be maintained when making this check. The clearance should be 0.048-0.061 inch.

6. If the clearance is not within specifications, selective snap rings are available in the following thicknesses: 0.054-0.060, 0.065-0.069, 0.074-0.078, 0.083-0.087 and 0.092-0.096 inch. Insert the correct size snap ring and recheck the clearance.

INPUT SHELL AND SUN GEAR

Disassembly

1. Remove the rear snap ring from the sun gear as shown in Fig. 62.

2. Remove the thrust washer from the input shell and sun gear (Fig. 63).

3. Working from inside the input shell remove the sun gear. Remove the forward snap ring from the gear.

Assembly

1. Install the forward snap ring on the forward end (short end) of

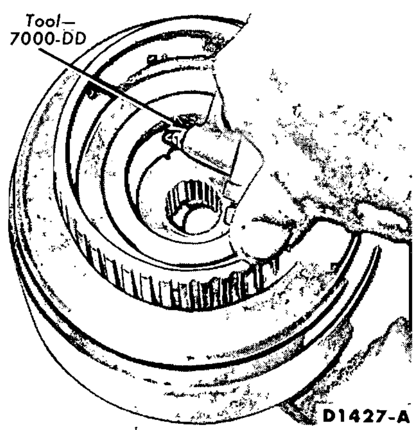


FIG. 60—Removing Forward Clutch Piston

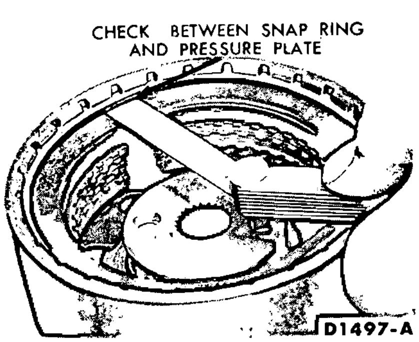


FIG. 61—Checking Forward Clutch Snap Ring Clearance

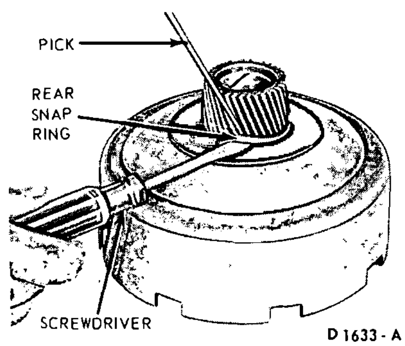


FIG. 62—Removing or Installing Sun Gear Rear Snap Ring

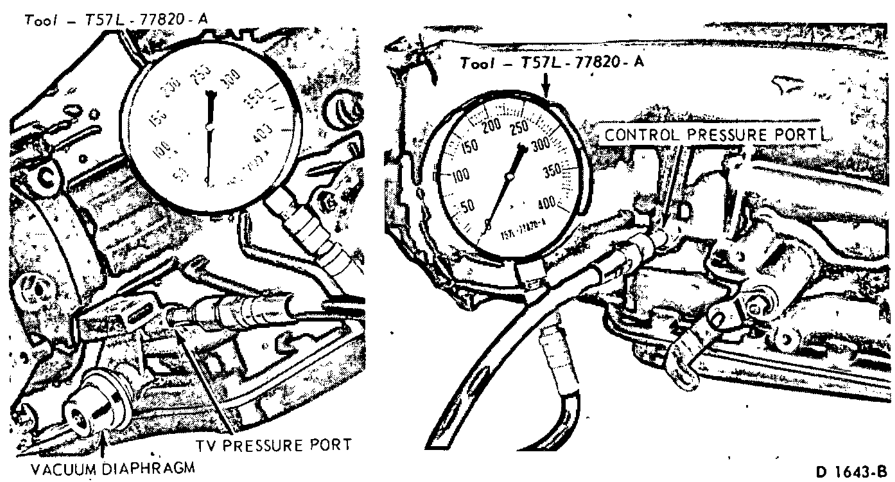


FIG. 63—Input Shell and Sun Gear Disassembled

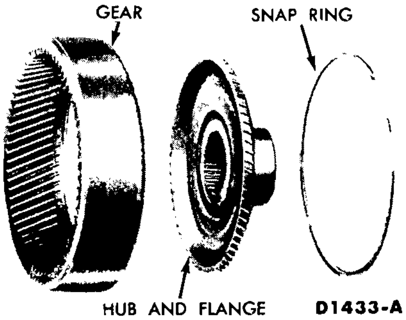


FIG. 64—Output Shaft Hub and Ring Gear

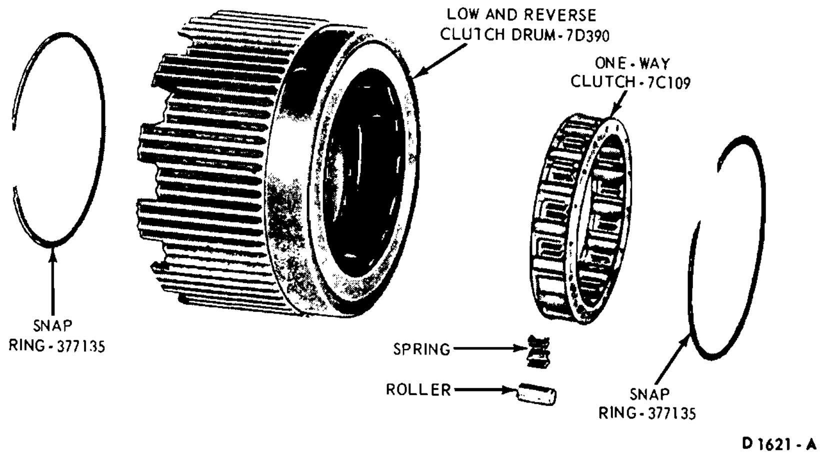


FIG. 65—One-Way Clutch Disassembled

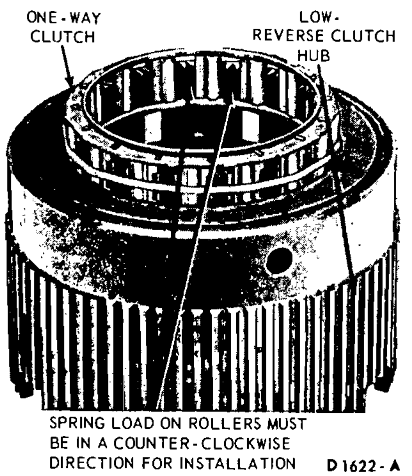


FIG. 66—Installing One-Way Clutch

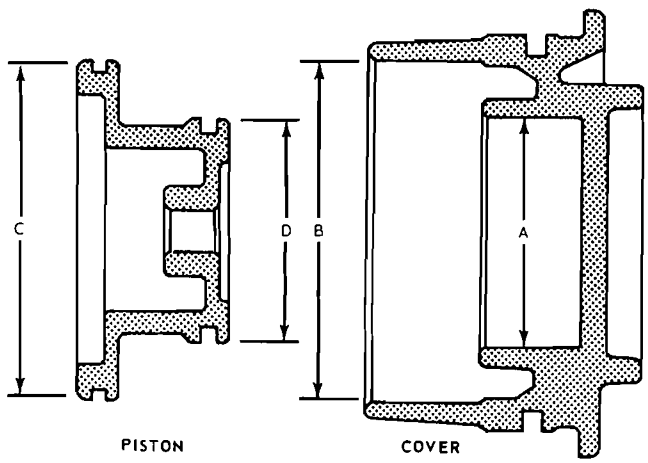
the sun gear (Fig. 63). Working from inside the input shell, slide the sun gear and snap ring into place making sure that the longer end is at the rear (Fig. 63).

2. Place the No. 6 thrust washer on the sun gear and install the rear snap ring.

OUTPUT SHAFT HUB AND RING GEAR

Disassembly

1. Remove the hub retaining snap ring (Fig. 64) from the ring gear.



Models	Piston Assembly	Cover	Diameter – Inches A	B	C	D
PGA-B, C	C6AP-7D021-B	C6SP-7D027-A	2.040	3.025	3.016	2.031
PGA-F,G	C6AP-7D021-C	C6AP-7D027-A	2.075	2.980	2.971	2.066
PGA-M,P,R	C6AP-7D021-D	C6AP-7D027-D	2.342	3.025	3.016	2.333

D1805-A

FIG. 67—Intermediate Servo Cover and Piston Dimensions

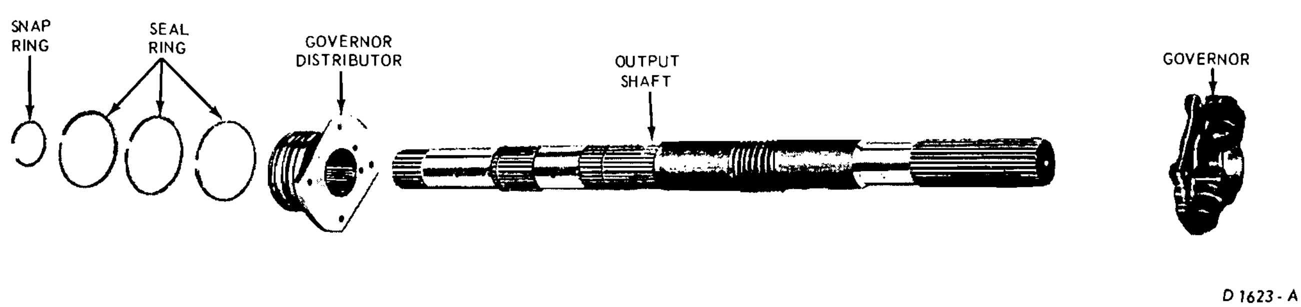


FIG. 68—Output Shaft Disassembled

2. Lift the hub from the ring gear.

Assembly

1. Position the hub in the ring gear.
2. Secure the hub with the retaining snap ring. Make certain that the snap ring is fully engaged with the groove.

ONE-WAY CLUTCH

Disassembly

1. Remove the snap ring (Fig. 65) from the rear of the low-reverse clutch hub.
2. Lift the one-way clutch from the hub.
3. Remove the remaining snap ring from the hub.

Assembly

1. Install the snap ring in the inner groove of the low-reverse clutch hub.
2. Make sure that all of the rollers are in place and that the springs contact them properly.
3. Place the low-reverse clutch hub on the bench with the one-way clutch race facing upward.
4. Place the one-way clutch on the hub so that the springs load the rollers in a counterclockwise direction when looking downward at the unit (Fig. 66).
5. Work each roller inward just enough to enter it in the ramp. Do this to each individual roller until the one-way clutch is positioned in the race. Placing a rubber band around the clutch as shown in Fig. 66 helps to contract the rollers to permit installation. After all of the rollers have started, remove the rubber band.
6. Install the snap ring at the rear of the low-reverse clutch hub to secure the one-way clutch.

SERVO

Disassembly

1. Apply air pressure to the port in the servo cover to remove the piston and stem.
2. Remove the seals from the piston.
3. Remove the seal from the cover.

Assembly

1. Dip the new seals in transmission fluid.
2. Install new seals on the cover and servo piston. Fig. 67 shows the correct servo piston and cover for the transmission.
3. Dip the piston in transmission fluid and install it in the cover.

LOW-REVERSE CLUTCH PISTON

Disassembly

1. Remove the inner and the outer seal from the reverse clutch piston.

Assembly

1. Dip the two new seals in clean transmission fluid.
2. Install the seals on the piston.

OUTPUT SHAFT

Disassembly

1. Remove the governor attaching bolts and remove the governor.
2. Remove the snap ring that secures the governor distributor on the output shaft (Fig. 68) and slide it off the front of the shaft.
3. Remove the seal rings from the distributor.

Assembly

1. Carefully install new seal rings on the distributor.
2. Working from the front end of the output shaft, slide the governor distributor into place on the shaft. Install the snap ring to secure it. Make sure that the snap ring is seated in the groove.
3. Position the governor on the distributor (Fig. 68) and secure them with the attaching screws.

ASSEMBLY OF TRANSMISSION

1. Place the transmission case in a holding fixture.
2. Position the low-reverse clutch piston so that check ball is in the 6 O'clock position (toward bottom of case) and tap the piston into place in the case with a clean rubber hammer.
3. Hold the one-way clutch inner race in position and install and torque the attaching bolts to specification.
4. Install a low-reverse clutch return spring in each pocket in the clutch piston. Press the springs firmly into the piston to prevent them from falling out.
5. Position the spring retainer over the springs and position the retainer snap ring in place on the one-way clutch inner race.
6. Install the compressing tool shown in Fig. 37 and compress the springs just enough to install the low-reverse clutch piston retainer snap ring.
7. Install the snap ring, then remove the compressing tool.
8. Place the transmission case on the bench with the front end facing downward.
9. Position the parking gear thrust washer and the gear on the case (Fig. 41).
10. Position the oil distributor and tubes in place on the rear of the case. Install and torque the attaching bolts to specification.
11. Install the output shaft and governor as an assembly.
12. Place a new gasket on the rear of the transmission case. Position the extension housing on the case and install the attaching bolts. Torque the attaching bolts to specification.
13. Place the case in the holding fixture.
14. Align the low-reverse clutch hub and one-way clutch with the inner race at the rear of the case. Rotate the low-reverse clutch hub clockwise while applying pressure to seat it on the inner race.
15. Install the low-reverse clutch plates, starting with a steel plate and following with friction and steel plates alternately. If new composition plates are being used, soak them in clean transmission fluid for fifteen minutes before installation. Install the pressure plate and the snap ring. Test the operation of the low-reverse clutch by applying air pressure at the clutch pressure apply hole in the case. The transmission cases are machined to accommodate a five-plate clutch pack.
16. Install the reverse planet ring gear thrust washer and the ring gear and hub assembly. Insert the snap ring in the groove in the output shaft.
17. Assemble the front and rear thrust washers onto the reverse planet assembly. Retain them with vaseline, and insert the assembly into the ring gear. Install the snap ring in the ring gear.
18. Set the reverse-high clutch on the bench, with the front end facing down. Install the thrust washer on the rear end of the reverse-high clutch assembly. Retain the thrust washer with vaseline and insert the splined end of forward clutch into the open end of the reverse-high clutch so that the splines engage the reverse-high friction plates (Fig. 51).
19. Install the thrust washer and retain it with vaseline, on the front

end of the forward planet ring gear and hub. Insert the ring gear into the forward clutch.

20. Install the thrust washer on the front end of the forward planet assembly. Retain the washer with vaseline and insert the assembly into the ring gear. Install the input shell and sun gear assembly.

21. Install the reverse-high clutch, forward clutch, forward planet assembly and input shell and sun gear as an assembly into the transmission case.

22. Insert the intermediate band into the case around the direct clutch cylinder with the narrow band end facing toward the servo apply level. Install the struts and tighten the band adjusting screw sufficiently to retain the band.

23. Place the selective thickness bronze thrust washer on the rear shoulder of the stator support and retain it with vaseline. If the end play was not within specification when checked prior to disassembly, replace the washer with one of proper thickness. Refer to Specifications Section for selective thrust washer thicknesses. Lay a new gasket on the rear mounting face of the pump and position the pump on the case being careful not to damage the O-ring. Install six of the seven mounting bolts and torque them to specification.

24. Adjust the intermediate band as detailed in Section 2 and install the input shaft with the long splined end inserted into the forward clutch assembly.

25. Install tool 4201-C at the seventh pump mounting bolt (Fig. 32) and check the transmission end play. Remove the tool.

26. Install the control valve in the case, making sure that the levers engage the valves properly.

27. Install the primary throttle valve, rod, and the vacuum diaphragm in the case.

28. Install a new pan gasket and the oil pan.

29. Install the converter assembly.

30. Install the transmission in the car.

PART 7-4— Specifications

APPROXIMATE REFILL CAPACITIES

		U.S. Measure	Imperial Measure
C-4 Transmission — Comet, Falcon, Fairlane, Mustang and Cougar	—170 and 200 Engines	8 qt	6-1/2 qt
	All Other Engines	9 qt	7-1/4 qt
C-6 Transmission — All Models		13 qt	10-3/4 qt

CONVERTER IDENTIFICATION AND STALL SPEEDS
C4 TRANSMISSION

Converter Part Number	Nominal Size	Stall Ratio	Identification ①	Transmission Model	Engine CID	Stall Speed
C5AP-7902-V	11 1/4	2.10:1	AJ	PEE-B, C, E, H, J	289-2V	1750–1950 ②
				PEE-C, H	289-4V	1750–1950 ② ③ 1800–2000 ② ④
				PEE-K	289-4V H.P.	1750–1950 ②
C5DP-7902-D	10 1/4	2.10:1	AL	PEB-A	170-1V	1400–1600 ②
				PEB-B, C, E, F	200-1V	1550–1750 ③

① Converter identification is stamped on the converter cover adjacent to the converter drive stud.
② For thermactor equipped engines, subtract 50-RPM.
③ With single exhaust systems.
④ With dual exhaust systems.

C6 TRANSMISSION

Converter Part Number	Nominal Size	Stall Ratio	Identification No. ①	Transmission Model	Engine CID	Stall Speed
C6AP-7902-B	12	2.10:1	31	PGA-B, C	390-2V	1700–1900
C7AP-7902-C	12	2.10:1	43	PGA-F, G	390-4V	1750–1950
				PGA-M, P	390-4V GT	1700–1900

① Converter identification is stamped on the converter cover adjacent to the converter drive stud.

CONTROL PRESSURE AT ZERO GOVERNOR RPM
C4 TRANSMISSION

Engine Speed	Throttle	Manifold Vac. Ins. Hg	Range	P.S.I.
Idle	Closed	① Above 18	P, N, D 2, 1 R	55–61 55–113 55–202
As Required	As Required	10	D, 2, 1	93–104
As Required	As Required	Below 1.0	D, 2, 1 R	137–150 245–268

① At altitudes above sea level, it may not be possible to obtain 18 inches of engine vacuum at idle. For idle vacuums of less than 18 inches, refer to the following table to determine idle speed pressure specification in D driving range.

Engine Vacuum	Line Pressure
17 inches	55–66
16 inches	55–71
15 inches	55–76
14 inches	55–81
13 inches	55–86
12 inches	55–91
11 inches	55–96

CONTROL PRESSURE AT ZERO GOVERNOR RPM — C6 TRANSMISSION

Engine Speed	Idle			As Required		As Required		
Throttle	Closed			As Required		As Required		
Manifold Vacuum (Inches Hg)	Above 18 ①			10		Below 1.0		
Range	Control Pressure (psi)		TV Pressure	Control Pressure (psi)	TV Pressure	Control Pressure (psi)		TV Pressure
	P, N, D, 2, 1	R	(psi)	D, 2, 1	(psi)	D, 2, 1	R	(psi)
psi @ Barometric Pressure 29.5 Sea Level	40–61	60–93	0–10	100–114	40–44	154–180	234–275	77–87

① It may not be possible to obtain 18 inches of engine vacuum at idle. For idle vacuums of less than 18 inches the following table provides idle speed pressure specification in D range:

Manifold Vacuum	T.V.	Cont.
17	11–14	55–68
16	15–18	55–75
15	20–22	55–81
14	23–26	55–87
13	28–31	55–94
12	32–35	55–100
11	36–40	55–108

CHECKS AND ADJUSTMENTS—C4 TRANSMISSION

Operation	Specification			
Transmission End Play	0.008–0.042 inch (Selective Thrust Washers Available)			
Turbine and Stator End Play	0.060 inch (maximum)			
Intermediate Band Adjustment	Adjust screw to 10 ft-lbs torque, then back off 1-3/4 turns.			
Low-Reverse Band Adjustment	Adjust screw to 10 ft-lbs torque, then back off 3 turns.			
Selective Snap Ring Thickness	0.102–0.106	0.088–0.092	0.074–0.078	0.060–0.064

CHECKS AND ADJUSTMENTS—C6 TRANSMISSIONS

Operation	Specification				
Transmission End Play	0.008–0.044 (Selective Thrust Washers Available)				
Turbine and Stator End Play	0.060				
Intermediate Band Adjustment	Adjust screw to 10 ft-lbs torque, then back off 1 turn and tighten lock nut to specification.				
Forward Clutch Pressure Plate-to-Snap Ring Clearance	0.048–0.061				
Selective Snap Ring Thicknesses	0.054–0.060	0.065–0.069	0.074–0.078	0.083–0.087	0.092–0.096
Reverse-High Clutch Pressure Plate-to-Snap Ring Clearance	Transmission Models				
	PGA				
	0.022–0.036				
Selective Snap Ring Thicknesses	0.065–0.069	0.074–0.078	0.083–0.087		

SELECTIVE THRUST WASHERS—C4 TRANSMISSION

Thrust Washer No. 1		Thrust Washer No. 2	
Nylon Thrust Washer W/Tangs	Color of Washer	No. Stamped On Washer	Metal Thrust Washer
0.070–0.074	Green	5	0.109–0.107
0.087–0.091	Natural	4	0.092–0.090
0.104–0.108	Black	3	0.075–0.073
0.121–0.125	Yellow	2	0.058–0.056
0.138–0.142	Blue	1	0.043–0.041

SELECTIVE THRUST WASHERS—C6 TRANSMISSION

Identification No.	Thrust Washer Thickness–Inch
1	0.056–0.058
2	0.073–0.075
3	0.088–0.090
4	0.103–0.105
5	0.118–0.120

CLUTCH PLATES — C4 TRANSMISSION

Model	Forward Clutch			Reverse Clutch		
	External Spline (Steel-Grit Blasted)	Internal Spline (Comp.)	Free Pack Clear (Inches)	External Spline (Steel)	Internal Spline (Comp.)	Free Pack Clear (Inches)
PEB	3 (4) ①	4 (5) ①	0.020–0.036 ②	3 (5) ①	3 (3) ①	0.050–0.066
PEE	4	5	0.026–0.042	4	4	0.050–0.066

① Use the quantities shown in parenthesis when a service replacement cylinder is installed.
② 0.026–0.042 inches on PEB models with service replacement cylinder.

CLUTCH PLATES—C6 TRANSMISSION

Transmission Model		Steel Plates	Friction Plates
Low–Reverse Clutch Plates	–PGA	5 (7)	5
Reverse–High Clutch Plates	–PGA	3	3
Forward Clutch Plates	–PGA	3	4

CONTROL VALVE SPRING IDENTIFICATION — C4 TRANSMISSION

Spring	Total Coils	Free Length (Inches)	O.D. (Inches)	Wire Dia. (Inches)	Lbs. Load At Length (Inches)	Load
Manual Valve Detent	9	0.74	0.295	0.045	0.601	7.5
2-3 Backout Control Valve	10	1.515	0.450	0.026	0.580	1.353
Main Oil Press. Reg. Valve	12.0	2.53	0.615	0.047	0.716	7.24
Throttle Press. Modulator	15	1.513	0.292	0.0286	0.620	3.675
Drive 2 Valve	10	0.735	0.230	0.019	0.450	0.80
Throttle Downshift Valve	9	0.962	0.380	0.034	0.440	3.44
Throttle Downshift Valve ①	9	1.00	0.380	0.036	0.440	4.64
Throttle Press. Booster Valve ②	15	1.39	0.249 I.D.	0.036	0.730	5.250
Throttle Press. Booster Valve ④	15	1.279	0.254	0.036	0.730	4.172
Control Press. Booster Valve	12.8	1.66	0.350	0.028	0.696	1.63
Inter. Band Accumulator Valve ③	9.5	1.28	0.375	0.028	0.400	1.56
Line Coasting Boost Valve	10	1.062	0.346	0.032	0.464	3.54
Line Coasting Boost Valve ①	10	1.02	0.346	0.034	0.464	4.25

① Used on Models PEE-D, E
② Used on all Models except PEE-K
③ None used on Models PEE-D, E, K
④ Used only on Model PEE-K

CONTROL VALVE SPRING IDENTIFICATION—C6 TRANSMISSIONS

Spring	Total Coils	Free Length (Inches)	O.D. (Inches)	Wire Dia. (Inches)	Lbs. Load At Length (Inches)	Load
Manual Valve Detent	9	0.740	0.295	0.045	0.601	7.50
2-1 Scheduling Valve	12	0.810	0.245	0.023	0.385	1.465
1-2 Shift Valve	20	1.160	0.235	0.025	0.650	1.725
Throttle Modulator Valve	17.6	1.257	0.280	0.0286	0.660	2.30
Throttle Pressure Booster Valve	18	1.395	0.311	0.041	0.905	6.36
3-2 Shift Timing Valve	18 1/2	1.900	0.340	0.032	0.784	4.25
Line Pressure Coasting Boost Valve	8	0.684	0.385	0.025	0.352	0.68
Intermediate Servo Capacity Modulator Valve	10	0.726	0.250	0.018	0.313	0.63
Throttle Downshift Valve	12	0.790	0.240	0.023	0.480	1.15
Front Pump Relief Valve	14	1.020	0.250	0.032	0.750	3.30
Intermediate Servo Accumulator Valve—Inner ①	9	1.630	0.500	0.035	0.397	3.72
Intermediate Servo Accumulator Valve—Outer ①	7	1.500	0.615	0.044	1.297	1.14
Intermediate Servo Accumulator Valve ②	12 1/2	1.500	0.355	0.035	0.600	5.52
Main Oil Pressure Regulator	7	1.190	0.690	0.054	0.549	6.45
2-3 Shift Valve—Outer	4	1.040	0.774	0.041	0.430	3.20
Converter Pressure Relief Valve and T.V. Relief ②	14	1.020	0.250	0.032	0.750	3.30
Converter Pressure Relief Valve ①	18 1/2	1.120	0.262	0.041	0.900	5.00

① Used in late Production models.
② Used in early Production models.

SHIFT SPEEDS—ACTUAL MPH
C4 TRANSMISSION—FAIRLANE (EXCEPT POLICE AND TAXI), COMET, FALCON & MUSTANG WITH 6 CYLINDER ENGINE

Throttle	Range	Shift	1	2	3	4	5
Closed (Above 18" Vacuum)	D	1-2	7-9	8-10	8-10	9-11	9-11
	D	2-3	10-19	11-20	11-21	12-22	13-23
	D	3-1	9	10	10	11	11
	1	2-1	16-24	16-26	17-27	19-29	20-30
To Detent (Torque Demand)	D	1-2	16-27	16-29	17-30	19-32	19-33
	D	2-3	30-44	31-46	32-48	36-51	37-54
	D	3-2	31	32	33	36	37
	D	2-1 or 3-1	18	18	19	20	21
Thru Detent W.O.T.	D	1-2	25-33	26-35	27-36	30-39	31-41
	D	2-3	49-61	51-64	52-56	58-71	59-74
	D	3-2	63	66	69	73	77
	D	2-1 or 3-1	26	27	28	30	31

Vehicle	Engine CID	Axle Ratio	Tire Size	Use Column No.
Falcon	200-1V	3.50:1	7.75 x 14	1
		3.25:1	7.75 x 14	3
	170-1V	3.20:1	6.50 x 13 or	
	or		6.95 x 14	2
	200-1V	2.83:1	6.50 x 13	4
			6.95 x 14	5
		2.80:1	6.95 x 13, 7.35 x 14	5
Fairlane or Comet	200-1V	3.50:1	7.35 x 14, 7.75 x 14	1
		3.25:1	7.35 x 14	2
			7.75 x 14	3
		3.00:1	8.95 x 14, 7.35 x 14, 7.75 x 14	4
		2.80:1	7.35 x 14	5
Mustang	200-1V	3.20:1	6.95 x 14, 7.35 x 14	3
		2.83:1	6.95 x 14, 7.35 x 14	5

SHIFT SPEEDS—ACTUAL MPH
C4 TRANSMISSION—FAIRLANE POLICE AND TAXI WITH 6 CYLINDER ENGINE

Throttle	Range	Shift	1	2	3	4	5
Closed (Above 18" Vacuum)	D	1-2	7-9	8-10	8-10	9-11	9-11
	D	2-3	10-19	11-20	11-21	12-22	13-23
	D	3-1	9	10	10	11	11
	1	2-1	22-30	23-32	24-33	27-35	27-37
To Detent (Torque Demand)	D	1-2	16-27	16-29	17-30	19-32	19-33
	D	2-3	30-44	31-46	32-48	36-51	37-54
	D	3-2	31	32	33	36	37
	D	2-1 or 3-1	18	18	19	20	21
Thru Detent (W.O.T.)	D	1-2	25-33	26-35	27-36	30-39	31-41
	D	2-3	49-61	51-64	52-66	58-71	59-74
	D	3-2	63	66	69	73	77
	D	2-1 or 3-1	26	27	28	30	31

Vehicle	Engine	Axle Ratio	Tire Size	Use Column No.
Fairlane	200 IV	3.50:1	7.35 x 14, 7.75 x 14	1
		3.25:1	7.35 x 14	2
			7.75 x 14	3
		3.00:1	8.95 x 14, 7.35 x 14	4
			7.75 x 14	
		2.80:1	7.35 x 14	5

SHIFT SPEEDS—ACTUAL MPH— C4 TRANSMISSION—FAIRLANE (EXCEPT POLICE AND TAXI), FALCON, COMET, COUGAR & MUSTANG 289-2V

Throttle	Range	Shift	1	2	3
Closed (Above 18" Vacuum)	D	1-2	8-11	9-11	9-11
	D	2-3	12-21	12-22	13-23
	D	3-1	11	11	11
	1	2-1	18-28	19-29	20-30
To Detent (Torque Demand)	D	1-2	21-33	22-34	22-36
	D	2-3	39-55	41-57	42-60
	D	3-2	35	36	37
	D	2-1 or 3-1	20	20	21
Thru Detent (W.O.T.)	D	1-2	30-39	32-41	33-43
	D	2-3	58-72	61-75	63-78
	D	3-2	71	74	77
	D	2-1 or 3-1	29	30	31

Vehicle	Axle Ratio	Tire Size	Use Column No.
Fairlane or Comet	3.00:1	6.95 x 14	1
		7.35 x 14, 7.75 x 14	2
	2.80:1	7.35 x 14	3
Falcon	2.80:1	6.95 x 14	3
Mustang or Cougar	2.80:1	6.95 x 14, 7.35 x 14	3

SHIFT SPEEDS—ACTUAL MPH— C4 TRANSMISSION—FAIRLANE POLICE AND TAXI 289-2V

Throttle	Range	Shift	1	2	3
Closed (Above 18" Vacuum)	D	1-2	8-11	9-11	9-11
	D	2-3	12-21	12-22	13-23
	D	3-1	11	11	11
	1	2-1	25-34	27-35	27-37
To Detent (Torque Demand)	D	1-2	21-33	22-34	22-36
	D	2-3	39-55	41-57	42-60
	D	3-2	35	36	37
	D	2-1 or 3-1	20	20	21
Thru Detent (W.O.T.)	D	1-2	30-39	32-41	33-43
	D	2-3	58-72	61-75	63-78
	D	3-2	71	74	77
	D	2-1 or 3-1	29	30	31

Vehicle	Axle Ratio	Tire Size	Use Column No.
Fairlane	2.80:1	7.35 x 14	3
	3.00:1	6.95 x 14	1
		7.35 x 14, 7.75 x 14	2

SHIFT SPEEDS—ACTUAL MPH— C4 TRANSMISSION—MUSTANG WITH 289-4V HIGH PERFORMANCE ENGINE

Throttle	Range	Shift	Tire Size F70 — Axle Ratio 3.89:1	Tire Size F70 — Axle Ratio 3.50:1
Closed (Above 18" Vacuum)	D	1-2	7-9	8-9
	D	2-3	10-17	11-19
	D	3-1	9	9
	1	2-1	18-29	20-32
To Detent (Torque Demand)	D	1-2	28-39	32-43
	D	2-3	53-62	60-69
	D	3-2	39	43
	D	2-1 or 3-1	26	29
Thru Detent (W.O.T.)	D	1-2	36-44	40-49
	D	2-3	66-76	74-84
	D	3-2	75	83
	D	2-1 or 3-1	40	44

SHIFT SPEEDS—ACTUAL MPH—
C4 TRANSMISSION—FALCON, MUSTANG (EXCEPT HP) & COUGAR WITH 289-4V ENGINE

Throttle	Range	Shift	1	2
Closed (Above 18" Vacuum)	D	1-2	6-11	7-11
	D	2-3	12-22	13-23
	D	3-1	11	11
	1	2-1	18-28	19-30
To Detent (Torque Demand)	D	1-2	24-37	26-38
	D	2-3	44-62	47-65
	D	3-2	36	38
	D	2-1 or 3-1	20	21
Thru Detent (W.O.T.)	D	1-2	33-43	35-45
	D	2-3	62-79	67-82
	D	3-2	74	77
	D	2-1 or 3-1	30	32

Vehicle	Axle Ratio	Tire Size	Use Column No.
Falcon	3.00:1	6.95 x 14	1
		7.35 x 14	1
		7.75 x 14	1
	2.80:1	6.95 x 14	2
		7.35 x 14	2
Mustang or Cougar	3.00:1	6.95 x 14	1
		7.35 x 14	1
		8.95 x 14	1
	2.80:1	6.95 x 14	2
		7.35 x 14	2

SHIFT SPEEDS—ACTUAL MPH—
C6 TRANSMISSION

Throttle	Range	Shift	1	2	3	4	5
Closed (Above 17" Vacuum)	D	1-2	7-9	7-9	6-9	6-8	7-3
	D	2-3	7-20	7-18	6-19	6-17	7-20
	D	3-1 or 2-1	7-9	7-9	6-9	6-8	7-3
	1	2-1	23-33	22-30	22-31	20-28	24-33
To Detent (Torque Demand)	D	1-2	28-44	25-40	29-45	24-37	33-49
	D	2-3	52-78	49-72	51-73	46-66	56-79
	D	3-2	21-41	20-38	20-39	18-35	22-41
Through Detent (W.O.T.)	D	1-2	39-49	37-45	43-51	34-42	47-55
	D	2-3	75-89	71-82	73-84	65-76	81-91
	D	3-2	67-79	63-73	65-75	53-68	72-81
	D	3-1	26-36	25-33	32-40	23-30	36-43

Vehicle	Engine CID	Tire Size	Axle Ratio	Use Column No.
Fairlane	390-2V, 4V	7.35 x 14	2.75:1	1
		7.75 x 14	3.00:1	2
Comet		F.70 x 14	3.25:1	4
Fairlane,	390-4V GT	F.70 x 14	3.00:1	5
Comet,		6.50/6.70 x 15	3.25:1	3
Mustang,				
Cougar				

TORQUE LIMITS

Item	Ft-Lbs	
	C4	C6
Converter to Flywheel	20–30	20–30
Converter Hsg. to Trans. Case	28–40	–
Front Pump to Trans. Case	28–40	12–16
Outer Race to Case	13–20	18–25
Oil Pan to Case	12–16	12–16
Rear Servo Cover to Case	12–20	–
Stator Support to Pump	12–20	12–16
Converter Cover to Converter Hsg.	12–16	12–16
Guide Plate to Case	–	12–16
Intermediate Servo Cover to Case	16–22	10–14
Extension Assy. to Trans. Case	28–40	25–35
Pressure Gauge Tap	9–15	9–15
Band Adj. Stop to Case	35–45	35–45
Manual Control Lever Nut	30–40	30–40
Downshift Lever to Shaft	12–16	12–16
Filler Tube to Engine	20–25	20–25
Transmission to Engine	–	40–50
Transmission to Engine: Comet, Falcon, Fairlane, Mustang–6 Cyl.	23–33	–
8 Cyl.	40–50	–
Diaphragm Assy. to Case	15–23	15–23
Distributor Sleeve to Case	12–20	12–20
Reverse Servo Piston to Rod	①	–
Cooler Tube Connector Lock	–	25–35
Convertor Drain Plug	20–30	14–28
End Plates to Body	20–35	20–30
Inner Downshift Lever Stop	20–30	20–30
Lower to Upper Valve Body	40–50	40–50
Reinforcement Plate to Body	40–55	20–30
Screen and Lower to Upper Valve Body	40–55	40–50
Neutral Switch to Case	55–75	55–75
Accumulator Plate to Body	80–120	–
Screen and Control Assy. to Case	80–120	–
Control Assy. to Case	80–120	100–120
Gov. Body to Collector Body	80–120	100–120
Cooler Line Fittings	80–120	–

① Tighten to 10 ft-lbs and back off 5/8 turn.

SPECIAL TOOLS

Ford Tool No.	Former No.	Description
TOOL FCO-24	–	Vacuum Diaphragm Wrench
T50T-100-A	–	Impact Slide Hammer
T58L-101-A	–	Puller Attachment
T53L-200-A	–	Handle Adapter
T57L-500-A	–	Bench Mounted Holding Fixture
TOOL-1175-AB	1175-AB	Grease Seal Remover (Head Only)
T50T-100-Aand TOOL-1175-AB	1175-AE	Seal Remover
TOOL-3552-H	3552-H	Special Jaws for 7600-E
TOOL-4201-C	4201-C	Differential Backlash and Runout Gauge, with Universal Bracket, Dial Indicator and Bracket
TOL-7000-DD	7000-DD	Air Nozzle Rubber Tip Assembly
T52L-7000-GAE	7000-G	Transmission Extension Housing Rear Bearing Remover
T52L-7000-HAE	7000-HF	Transmission Extension Housing Rear Bearing Remover
T64L-6001-A		Transmission Holding Fixture
T64P-7A128-A		Manual Valve Detent Spring
T64P-7B456-A and T65P-7B456-B	–	Clutch Race to Case Bolt Socket
T58L-101-A and T59L-100-B	7600-E	Seal Remover (Head and Hammer)
T61L-7657-A	7657-AA	Transmission Extension Housing Oil Seal Replacer
T61L-7657-B	7657-B	Transmission Extension Housing Oil Seal Replacer
T57P-7697-A	–	Transmission Extension Housing Bushing Remover
T57P-7697-B	–	Transmission Extension Housing Bushing Replacer
T60-K-7697-A	7000-AF	Transmission Extension Housing Bushing Remover
T59P-7902-B	7937-B	Welded Converter Sprag Driver and Gauge Post
T63P-7902-A	–	Converter Stator Check Adapter
T64L-7902-A	–	Welded Converter Sprag Driver and Gauge Post Adapter Kit for T59P-7902-B
T59P-77067		Dial Indicator Support Fixture
TOOL-77288	77288	Control Shaft Seal Replacer
T59P-77370-B	7345	Front Band Torque Wrench
T65P-77370-A		Rear Band Torque Wrench Mustang Only
T59P-77423-A	7355-B	Rear Band Torque Wrench
T65L-77515-A		Rear Clutch Spring Compressor
T57L-77820-L		400 lb Pressure Gauge
T63L-77837-A	77837-A	Front Pump Seal Replacer

Engine

GROUP 8

PART 8-1— *General Engine Service*

This part covers engine diagnosis, tests and adjustment and repair procedures. In addition, the cleaning and inspection procedures are covered.

For engine removal, disassembly, assembly, installation and major repair procedures, refer to the pertinent part of this group.

An engine identification tag is attached to the engine. The symbol code (Fig. 1) identifies each engine for determining parts usage; i.e., engine cubic inch displacement and model year. The change level and engine code number determine if parts are peculiar to a specific engine. The engine plant code designates where and when the engine was built. **It is imperitive that the codes on the engine identification tag be used when ordering parts or making inquiries about the engine. The pertinent codes are shown in the Master Parts Catalog to designate unique parts.**

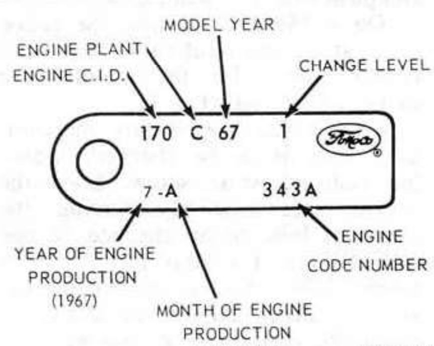


FIG. 1—Engine Identification Tag

1 DIAGNOSIS AND TESTING

DIAGNOSIS

ENGINE

On engines equipped with a Thermactor exhaust emission control system, disconnect the Thermactor system before performing engine diagnosis procedures. Disconnect the backfire suppressor valve vacuum sensing and air supply lines at the intake manifold connections. Plug the manifold connections to preclude leakage.

Engine performance complaints usually fall under one of the basic headings listed in the Diagnosis Guide (Fig. 51). When a particular trouble can not be traced to a definite cause by a simple check, the possible items that could be at fault are listed in the order of their probable occurrence. Check the items in the order listed. For example, under Poor Acceleration, the ignition system is listed as a probable cause of the trouble. All the conventional ignition system items that affect acceleration are listed. Check all these items before proceeding to the next probable cause.

IGNITION SYSTEM

For diagnosis procedures of ignition system malfunctions, refer to Group 9.

TESTING

CAMSHAFT LOBE LIFT

Check the lift of each lobe in consecutive order and make a note of the readings.

1. Remove the air cleaner. Remove the heater hose and positive crankcase ventilation line from the rocker arm cover. Remove the valve rocker arm cover(s).

2. On a 170 or 200 six or a 390 V-8, remove the valve rocker arm shaft assemblies and install a solid tappet-type push rod in the push rod bore of the camshaft lobe to be checked or use the adapter for ball-end push rods shown in Fig. 2.

On a 289 V-8, remove the rocker arm stud nut, fulcrum seat and rocker arm. Use the adapter for ball-end push rods (Fig. 3).

3. On a 427 V-8, if only one camshaft lobe is to be checked, loosen the lash adjusting screw. Slide the rocker arm assembly serving the camshaft lobe to be checked to one side. Secure it in this position with safety wire. To move the rocker arm on either end of the shaft, remove the retaining pin and washers, and slide the rocker arm off the shaft. **If all of the cam lobes are to be checked, remove the rocker arm shaft assembly(ies).**

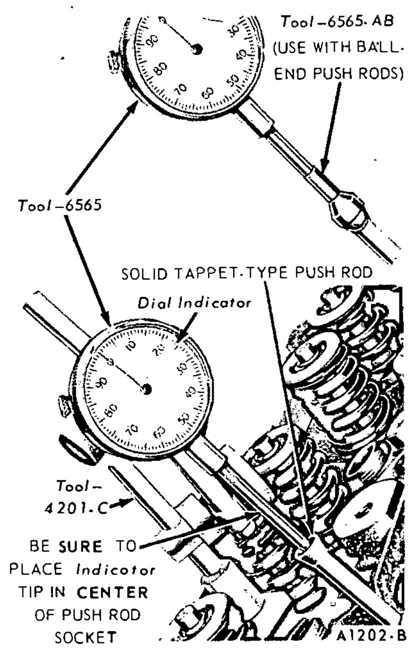


FIG. 2—Camshaft Lobe Lift—170 and 200 Six

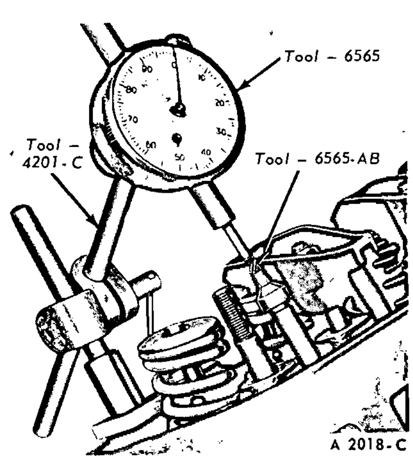


FIG. 3—Camshaft Lobe Lift-289 V-8

4. Make sure the push rod is in the valve lifter socket. Install a dial indicator in such a manner as to have the ball socket adapter of the indicator on the end of the push rod and in the same plane as the push rod movement (Fig. 2 or 3).

On a socket-type push rod, position the actuating point of the indicator in the push rod socket and in the same plane as the push rod movement (Fig. 2).

5. **Disconnect the brown lead (I terminal) and the red and blue lead (S terminal) at the starter relay.** Install an auxiliary starter switch between the battery and S terminals of the starter relay. **Crank the engine with the ignition switch OFF.**

Bump the crankshaft over until the tappet or lifter is on the base circle of the camshaft lobe. **At this point, the push rod will be in its lowest position.**

6. Zero the dial indicator. Continue to rotate the crankshaft slowly until the push rod is in the fully raised position.

7. Compare the total lift recorded on the indicator with specifications.

8. To check the accuracy of the original indicator reading, continue to rotate the crankshaft until the indicator reads zero. **If the lift on any lobe is below specified wear limits, the camshaft and the valve lifters operating on the worn lobe(s) must be replaced.**

9. On a 170 or 200 six or a 390 V-8, install the rocker arm shaft assemblies.

On a 289 V-8, lubricate the rocker arm fulcrum seat area with Lubriplate, and install the rocker arm, fulcrum seat and stud nut. Adjust the valve clearance (Section 2).

On a 289 high performance V-8, install the rocker arm, fulcrum seat and stud nut. Perform a preliminary valve lash adjustment.

On a 427 V-8, position the valve rocker arm. If an end valve rocker arm was removed, slide it into position on the shaft and install the washers and retaining pin. Tighten the valve lash adjusting screw to hold the rocker arm and push rod in alignment. Adjust the valve lash on all rocker arms that had been moved out of position. Install the valve rocker arm cover(s) and **partially tighten the retaining bolts.** Operate the engine until normal operating temperature has been reached. Remove the valve rocker arm cover(s). Check and adjust the valve lash (Section 2).

10. Install the valve rocker arm cover(s), hoses and the air cleaner.

MANIFOLD VACUUM TEST

A manifold vacuum test aids in determining the condition of an engine and in helping to locate the cause of poor engine performance. To check manifold vacuum:

1. Operate the engine for a minimum of 30 minutes at 1200 rpm

Gauge Reading	Engine Condition
Refer to Part 8-5	Normal engine idle manifold vacuum.
Low and steady.	Loss of power in all cylinders possibly caused by late ignition or valve timing, or loss of compression due to leakage around the piston rings.
Very low.	Intake manifold, carburetor, spacer or cylinder head gasket leak.
Needle fluctuates steadily as speed increases.	A partial or complete loss of power in one or more cylinders caused by a leaking valve, cylinder head or intake manifold gasket, a defect in the ignition system, or a weak valve spring.
Gradual drop in reading at engine idle.	Excessive back pressure in the exhaust system.
Intermittent fluctuation.	An occasional loss of power possibly caused by a defect in the ignition system or a sticking valve.
Slow fluctuation or drifting of the needle.	Improper idle mixture adjustment or carburetor, spacer or intake manifold gasket leak or restricted crankcase-ventilation system.

FIG. 4—Manifold Vacuum Gauge Readings

or until the engine is at normal operating temperature.

2. On 6-cylinder engines, install an accurate, sensitive vacuum gauge in the intake manifold fitting.

On a V-8, engine, remove the plug or power brake line at the rear of the intake manifold and install an accurate, sensitive vacuum gauge.

3. Operate the engine at recommended idle rpm, with the transmission selector lever in neutral.

4. Check the vacuum reading on the gauge.

Test Conclusions

Manifold vacuum is affected by carburetor adjustment, valve timing, ignition timing, the condition of the valves, cylinder compression, the condition of the positive crankcase ventilation system, and leakage of the manifold, carburetor, carburetor spacer or cylinder head gaskets.

Because abnormal gauge readings may indicate that more than one of the above factors are at fault, exercise caution in analyzing an abnormal reading. For example, if the vacuum is low, the correction of one item may increase the vacuum enough so as to indicate that the trouble has been corrected. It is important, therefore, that each cause of an abnormal reading be investigated and further tests conducted, where necessary, in order to arrive at the correct diagnosis of the trouble.

Fig. 4 lists various types of readings and their possible causes.

Allowance should be made for the effect of altitude on the gauge reading. The engine vacuum will decrease with an increase in altitude.

COMPRESSION TEST

Dynamic Compression Test

To perform a dynamic compression check, follow the procedures in Part 9-1, Section 1 under Ignition System Tests—Rotunda Testers.

Compression Gauge Check

1. Be sure the crankcase oil is at the proper level. Be sure the battery is fully charged. Operate the engine for a minimum of 30 minutes at 1200 rpm or until the engine is at normal operating temperature. Turn the ignition switch off, then remove all the spark plugs.

2. Set the throttle plates (primary throttle plates only on a 4-barrel carburetor) and choke plate in the wide open position.

3. Install a compression gauge in No. 1 cylinder.

4. **Disconnect the brown lead (I terminal) and the red and blue lead (S terminal) at the starter relay.** Install an auxiliary starter switch between the battery and S terminals of the starter relay. Using an auxiliary starter switch, crank the engine (with the ignition switch off) a minimum of five pumping strokes, and record the highest reading.

Note the number of compression strokes required to obtain the highest reading.

5. Repeat the test on each cylinder, cranking the engine the same number of times for each cylinder as was required to obtain the highest reading on the No. 1 cylinder.

Test Conclusions

A variation of 20 psi from specified pressure is satisfactory. However, the compression of all cylinders should be uniform within 20 psi.

A reading of more than the allowable tolerance above normal indicates excessive deposits in the cylinder or wrong cylinder head(s) on the engine.

A reading of more than the allowable tolerance below normal indicates leakage at the cylinder head gasket, piston rings or valves or wrong cylinder head(s) on the engine.

A low, even compression in two adjacent cylinders indicates a cylinder head gasket leak. This should be checked before condemning the rings or valves.

To determine whether the rings or the valves are at fault, squirt the equivalent of a tablespoon of heavy oil into the combustion chamber. Crank the engine to distribute the oil and repeat the compression test. The oil will temporarily seal leakage past the rings. If approximately the same reading is obtained, the rings are satisfactory, but the valves are leaking. If the compression has increased substantially over the original reading, there is leakage past the rings.

During a compression test, if the pressure fails to climb steadily and remains the same during the first two successive strokes, but climbs higher on the succeeding strokes, or fails to climb during the entire test, it indicates a sticking valve.

HYDRAULIC VALVE LIFTER TESTS

Dirt, deposits of gum and varnish and air bubbles in the lubricating oil

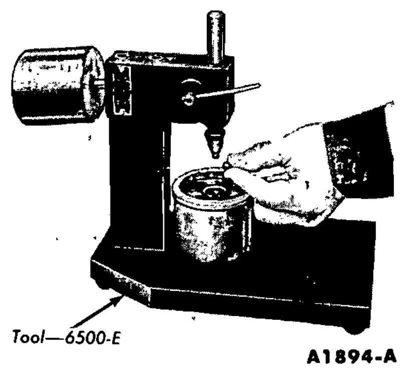


FIG. 5—Placing Steel Ball in Valve Lifter Plunger

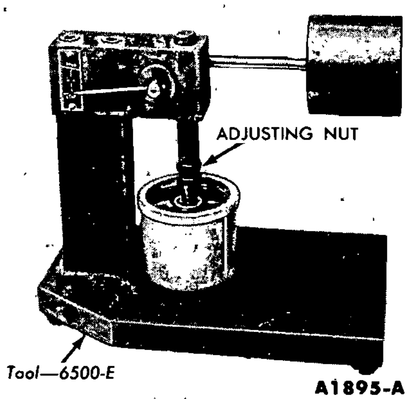


FIG. 6—Adjusting the Ram Length

can cause hydraulic valve lifter failure or malfunction.

Dirt, gum and varnish can keep a check valve from seating and cause a loss of hydraulic pressure. An open valve disc will cause the plunger to force oil back into the valve lifter reservoir during the time the push rod is being lifted to force the valve from its seat.

Air bubbles in the lubricating system can be caused by too much oil in the system or too low an oil level. Air may also be drawn into the lubricating system through an opening in a damaged oil pick-up tube. **Air in the hydraulic system can cause a loss of hydraulic pressure in the valve lifter.**

Assembled valve lifters can be tested with tool 6500-E to check the leak down rate. The leak down rate specification (Part 8-5) is the time in seconds for the plunger to move the length (Part 8-5) of its travel while under a 50 lb. load. Test the valve lifters as follows:

1. **Disassemble and clean the lifter to remove all traces of engine oil.** Lifters cannot be checked with engine oil in them. Only the testing fluid can be used.
2. Place the valve lifter in the tester, with the plunger facing upward. Pour hydraulic tester fluid into the cup to a level that will cover the valve lifter assembly. **The fluid can be purchased from the manufacturer of the tester. Do not use kerosene or any other fluid, for they will not provide an accurate test.**
3. Place a 5/16-inch steel ball in the plunger cup (Fig. 5).
4. Adjust the length of the ram so that the pointer is 1/16-inch below the starting mark when the ram contacts the valve lifter plunger (Fig. 6) to facilitate timing as the pointer passes the Start Timing Mark.

Use the center mark on the pointer scale as the Stop Timing point instead of the origninal Stop Timing mark at the top of the scale.

5. Work the valve lifter plunger up and down until the lifter fills with fluid and all traces of air bubbles have disappeared.
6. Allow the ram and weight to force the valve lifter plunger downward. Measure the exact time it takes for the pointer to travel from the Start Timing to the Stop Timing marks of the tester.
7. A valve lifter that is satisfactory must have a leak-down rate (time in seconds) within the minimum and maximum limits specified.
8. If the valve lifter is not within specifications, replace it with a new lifter.
9. Remove the fluid from the cup and bleed the fluid from the lifter by depressing the plunger up and down. **This step will aid in depressing the lifter plungers when checking the valve clearance.**

POSITIVE CRANKCASE VENTILATION SYSTEM TEST

A malfunctioning positive crankcase ventilation system may be indicated by loping or rough engine idle. Do not attempt to compensate for this poor idle condition by disconnecting the crankcase ventilation system and/or making carburetor adjustments. The removal of the crankcase ventilation system from the engine will adversely affect the fuel economy and engine ventilation with resultant shortening of engine life.

To determine whether the loping or rough idle condition is caused by a malfunctioning crankcase ventilation system, perform either of the following tests.

Regulator Valve Test

Install a known good regulator valve in the crankcase ventilation system.

Start the engine and compare the engine idle condition to the prior idle condition.

If the loping or rough idle condition remains when the good regulator valve is installed, the crankcase ventilation regulator valve is not at fault. Check the crankcase ventilation system for restriction at the intake manifold or carburetor spacer. If the system is not restricted, further engine component diagnosis will have to be conducted to find the malfunction.

If the idle contition is found to be satisfactory, leave the new regulator valve installed and clean the hoses, fittings, etc.

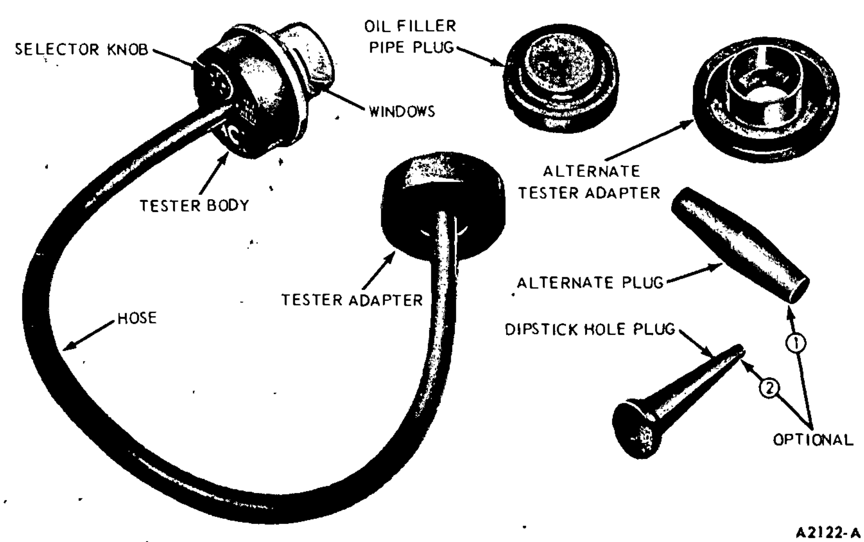


FIG. 7—AC Positive Crankcase Ventilation System Tester

COLOR	CAUSE
GREEN	System operating properly.
GREEN AND YELLOW	Regulator valve or system partially plugged. Slight kink in tester hose. Slight engine blow-by. Plugs from the kit or the engine vacuum lines are not properly sealed. Tester knob improperly set.
YELLOW	Regulator valve or system partially plugged. Tester hose kinked or blocked. Blow-by at maximum capacity of regulator valve. Plugs from the kit or the engine vacuum lines are not properly sealed. Tester knob improperly set.
YELLOW AND RED	Regulator valve or system partially or fully plugged. More engine blow-by than regulator valve can handle. Vent hose plugged or collapsed.
RED	Regulator valve or system fully plugged or stuck. Vent hose plugged or collapsed. Extreme blow-by.

FIG. 8—Diagnosis of Air Intake Test

Air Intake Test

This test uses the AC positive crankcase ventilation tester (Fig. 7) which is operated by engine vacuum through the oil filler opening. Follow the procedures described below to install the tester and check the crankcase ventilation system for faulty operation.

1. **With the engine at normal operating temperature,** remove the oil filler cap and the dipstick.
2. Connect one end of the hose to the tester body and connect the other end of the hose to the tester adapter.
3. Use the dipstick hole plug to plug the opening in the dipstick tube.
4. Insert the tester adapter in the filler cap opening and turn the selector knob (Fig. 7) to number 2 for the 289, 390 and 427 V-8 or number 4 for the 170 and 200 Six.
5. Start the engine and let it idle.
6. With the plugs secure, and the tube free of kinks, hold the tester body upright and note the color in the tester windows. Fig. 8 lists the various colors and the probable cause or related condition of the crankcase ventilation system.
7. Clean or replace the malfunctioning or defective components, and repeat the test to ensure that the crankcase ventilation system is operating satisfactorily.

THERMACTOR SYSTEM TESTS—BYPASS TYPE BACKFIRE SUPPRESSOR VALVE

The following procedures are recommended for checking and/or verifying that the various components of the Thermactor exhaust emission control system are operating properly. **The engine and all components must be normal operating temperatures when the tests are performed.** A preliminary "Diagnosis Guide" is included at the end of this Part (Fig. 52) as an aid in trouble shooting the Thermactor exhaust emission control system.

Prior to performing any extensive test or diagnosis of the Thermactor system, **it must be determined that the engine as a unit is functioning properly.** Disconnect the backfire suppressor valve vacuum sensing line at the intake manifold. Plug the manifold connection to preclude leakage. Normal engine diagnosis procedures can then be performed.

Check Valve Test

This test can be performed at the same time as the Air Pump Test.

1. Operate the engine until it reaches normal operating temperature.
2. Inspect all hoses and hose connections for obvious leaks and correct as necessary before checking the check valve operation.
3. Disconnect the air supply hose(s) at the check valve(s).
4. Visually inspect the position of the valve plate inside the valve body. It should be lightly positioned against the valve seat—away from the air manifold.
5. Insert a probe into the hose connection on the check valve and depress the valve plate. It should freely return to the original position, against the valve seat, when released.

If equipped with two check valve assemblies, check both valves for free operation.

6. Leave the hose(s) disconnected and start the engine. Slowly increase the engine speed to 1500 rpm and watch for exhaust gas leakage at the check valve(s). **There should not be any exhaust leakage.** The valve may flutter or vibrate at idle speeds, but this is normal due to the exhaust pulsations in the manifold.
7. If the check valve(s) does not meet the recommended conditions (steps 4,5 and 6), replace it.

Backfire Suppressor Valve Air Leakage Test

Air Gulp and Air Bypass Type Systems. With the backfire suppressor valve connected in the Thermactor System, set the idle to the specified engine RPM and adjust the carburetor fuel air mixture screws (Part 10-1).

If the idle remains rough or it is impossible to reduce the engine idle speed to the specified RPM, disconnect the following:

Air Gulp System. Disconnect the vacuum sensing tube at the valve and plug the tube end.

Disconnect the hose connecting the intake manifold to the backfire suppressor valve at the valve end and plug the hose.

Air Bypass System. Disconnect the vacuum sensing tube at the valve and plug the tube end.

If the idle can now be smoothed, or specified RPM achieved, the valve is defective. Replace the valve.

If there is no difference in idle quality or RPM, reconnect the hose and line and check the induction system or base engine for other possible causes of poor idle quality or high idle RPM.

Backfire Suppressor Valve Function Test

Air Gulp System.

1. Disconnect the rubber hose connecting the air pump to the backfire suppressor valve at the valve. Make certain the hose leading to the intake manifold is free of kinks.

2. Open and close the throttle rapidly. A loud sucking noise should be heard if the valve is functioning properly.

3. If the sucking noise is not heard and the engine backfires through the exhaust system during deceleration, the backfire suppressor valve should be replaced.

Air Bypass System.

1. Disconnect the rubber hose connecting the backfire suppressor valve to the carburetor air cleaner or air supply pump air filter, at the valve end.

2. Open and close the throttle rapidly; an escaping compressed air noise should be heard from the valve on rapid opening of the throttle and during deceleration. This is normal.

3. If the compressed air noise is not heard during deceleration, the backfire suppressor valve should be replaced.

Air Supply Pump Test

1. Assemble a test gauge adapter as shown in Fig. 9, and install a fuel pump test gauge on the adapter. **The test gauge used must be accurate and readable in 1/4 psi increments.**

2. Operate the engine until it reaches normal operating temperature.

3. Inspect all hoses and hose connections for leaks and correct as necessary before checking the air supply pump.

4. Check the air pump belt tension and adjust to specifications.

5. Disconnect the air supply hose(s) at the air manifold check valve(s). If there are two check valves, close off one hose by inserting a suitable plug in the end of the hose. **Use a hose clamp and secure the plug so it will not blow out.**

6. Insert the open pipe end of the test gauge adapter in the other air supply hose. **Clamp the hose securely to the adapter to prevent it from blowing out.**

Position the adapter and test gauge so that the air blast emitted through the drilled pipe plug will be harmlessly dissipated.

7. Install a tachometer on the engine. Start the engine and slowly increase the engine speed to 1500 rpm. Observe the pressure produced at the

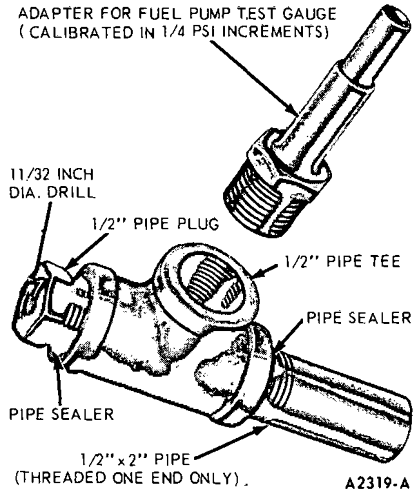


FIG. 9—Air Supply Pump Test Gauge Adapter

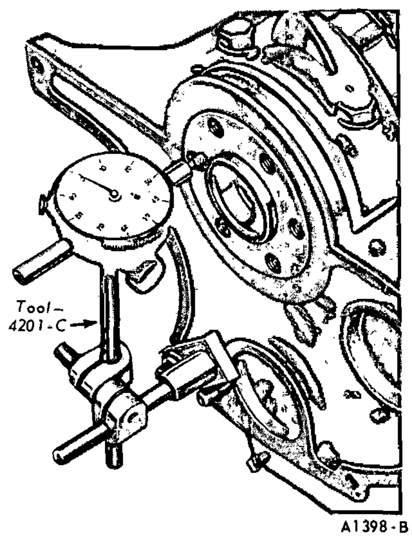


FIG. 10—Typical Crankshaft End Play

test gauge. The air pressure should be one (1) psi or more.

8. If the air pressure does not meet or surpass the above pressures, disconnect and plug the air supply hose to the backfire suppressor valve. Clamp the plug in place, and repeat the pressure test.

If the air pump pressure still doesn't meet the minimum requirement, install a new air pump filter element and repeat the pump test. Replace the air pump filter element and/or air pump as determined by the result of this test.

CRANKSHAFT END PLAY

1. Force the crankshaft toward the rear of the engine.

2. Install a dial indicator so that the contact point rests against the

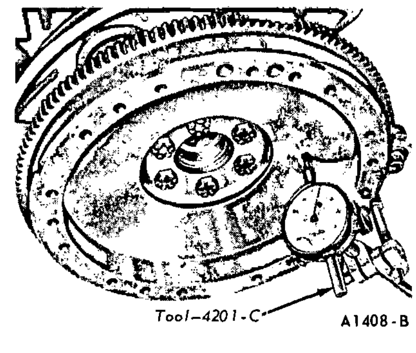


FIG. 11—Typical Flywheel Face Runout

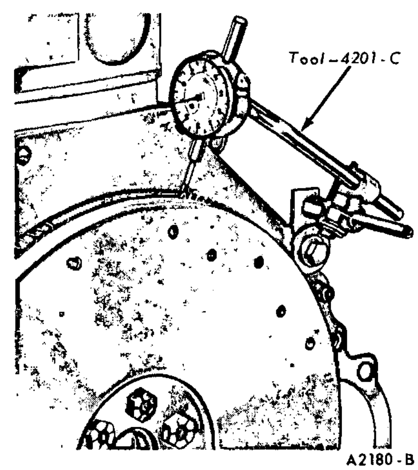


FIG. 12—Typical Flywheel Ring Gear Runout

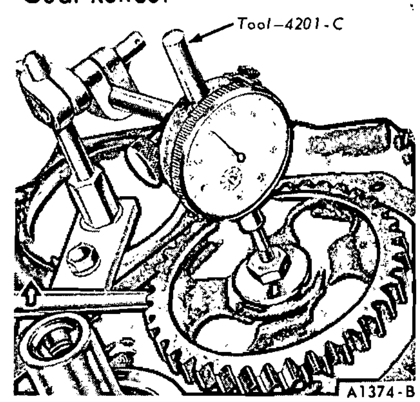


FIG. 13—Typical Camshaft End Play

crankshaft flange and the indicator axis is parallel to the crankshaft axis (Fig. 10).

3. Zero the dial indicator. Push the crankshaft forward and note the reading on the dial.

4. If the end play exceeds the wear limit, replace the thrust bearing. If the end play is less than the minimum limit, inspect the

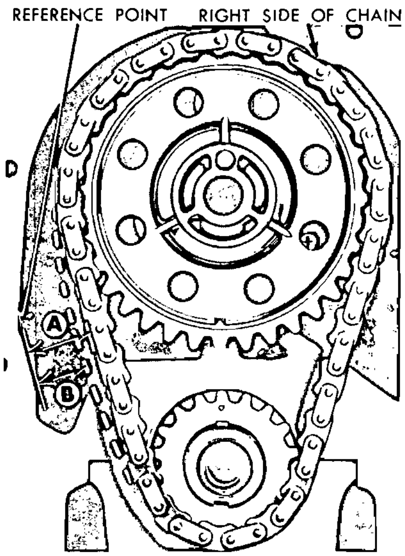


FIG. 14—Typical Timing Chain Deflection

thrust bearing faces for scratches, burrs, nicks or dirt. If the thrust faces are not defective or dirty, they probably were not aligned properly. Install the thrust bearing and align the faces following the procedure recommended under Main Bearing Replacement in the pertinent engine section. Check the crankshaft end play.

FLYWHEEL FACE RUNOUT—MANUAL-SHIFT TRANSMISSIONS

Install a dial indicator so that the indicator point bears against the flywheel face (Fig. 11). Turn the flywheel making sure that it is full forward or rearward so that crankshaft end play will not be indicated as flywheel runout.

If the clutch face runout exceeds the specifications, remove the flywheel and check for burrs between the flywheel and the face of the crankshaft mounting flange. If no burrs exist, check the runout of the crankshaft mounting flange. Replace the flywheel or machine the crankshaft flywheel mounting face if the mounting flange runout is excessive.

If the ring gear runout exceeds specifications, replace it or reinstall it on the flywheel, following the procedure under Ring Gear Replacement this part Section 2.

FLYWHEEL RUNOUT—AUTOMATIC TRANSMISSION

Remove the spark plugs.

Install a dial indicator so that the indicator point rests on the face of the ring gear adjacent to the gear teeth.

Push the flywheel and crankshaft forward or backward as far as possible to prevent crankshaft end play from being indicated as flywheel runout.

Set the indicator dial on the zero mark. Turn the flywheel one complete revolution while observing the total indicator reading (T.I.R.). If the T.I.R. exceeds specifications, the flywheel and ring gear assembly must be replaced.

FLYWHEEL RING GEAR RUNOUT

Install the dial indicator so that the point rests on a tooth of the ring gear (Fig. 12), and check the outside diameter (O.D.) of the assembled flywheel and ring gear. **For this check, carefully adjust the indicator on the gear tooth so that the indicator point is near the extreme limit of its travel. This will prevent the indicator point from catching between the gear teeth as the flywheel is turned.** Set the indicator dial on the zero mark and slowly turn the flywheel through one revolution while observing the total indicator reading. The T.I.R. must be within specifications, or the ring gear (standard transmission) or flywheel and ring gear assembly (automatic transmission) must be replaced.

CAMSHAFT END PLAY

On all V-8 engines, prying against the aluminum-nylon camshaft sprocket, **with the valve train load on the camshaft,** can break or damage the sprocket. Therefore, the rocker arm adjusting nuts must be backed off, or the rocker arm and shaft assembly must be loosened sufficiently to free the camshaft. After checking the camshaft end play, adjust the valve clearance.

Push the camshaft toward the rear of the engine. Install a dial indicator so that the indicator point is on the camshaft sprocket retaining screw (Fig. 13). Zero the dial indicator. Position a large screw driver between the camshaft sprocket and the block. Pull the camshaft forward and release it. Compare the dial indicator reading with specifications. If the end play is excessive, replace the thrust plate. Remove the dial indicator.

TIMING CHAIN DEFLECTION

1. Rotate the crankshaft in a clockwise direction (as viewed from the front) to take up the slack on the left side of the chain.

2. Establish a reference point on the block and measure from this point to the chain (Fig. 14).

3. Rotate the crankshaft in the opposite direction to take up the slack on the right side of the chain. Force the left side of the chain out with the fingers and measure the distance between the reference point and the chain. The deflection is the difference between the two measurements.

If the deflection exceeds specifications, replace the timing chain and sprockets.

2 COMMON ADJUSTMENTS AND REPAIRS

ADJUSTMENTS

VALVE CLEARANCE—HYDRAULIC VALVE LIFTERS, 170 and 200 SIX

A 0.060-inch shorter push rod or a 0.060-inch longer push rod are available for service to provide a means of compensating for dimensional changes in the valve mechanism. Refer to the Master Parts List or the specifications for the pertinent color code. Valve stem to valve rocker arm clearance should be to the specified clearance with the hydraulic lifter completely collapsed. Repeated valve reconditioning operations (valve and/or valve seat refacing) will decrease the clearance to the point that if not compensated for, the hydraulic valve lifter will cease to function.

To determine whether a shorter or a longer push rod is necessary, make the following check:

1. Disconnect the brown lead (I terminal) and the red and blue lead (S terminal) at the starter relay. Install an auxiliary starter

switch between the battery and S terminals of the starter relay. **Crank the engine with the ignition switch OFF** until the No. 1 piston is on TDC after the compression stroke. By using the procedure in step 3, check the following valves:

No. 1 Intake
No. 1 Exhaust
No. 2 Intake
No. 3 Exhaust
No. 4 Intake
No. 5 Exhaust

2. Now rotate the crankshaft until the No. 6 piston is on TDC after the compression stroke (1 revolution of the crankshaft). By using the procedure in step 3, check the following valves:

No. 2 Exhaust
No. 3 Intake
No. 4 Exhaust
No. 5 Intake
No. 6 Intake
No. 6 Exhaust

3. Using Tool—6513-K apply pressure to the push rod end of the rocker arm (Fig. 15) to slowly bleed down the valve lifter until the plunger is completely bottomed. Hold the lifter in this position and check the available clearance between the rocker arm and the valve stem tip with a feeler gauge.

If the clearance is less than specifications, install an under size push rod. If the clearance is greater than specifications, install an oversize push rod.

VALVE CLEARANCE—HYDRAULIC VALVE LIFTERS, 289 REGULAR V-8

Two different procedures may be used to adjust the valve clearance on the 289 V-8 engine. The preferred procedure is recommended, but the alternate procedure may be used.

Preferred Procedure

The cylinders are numbered from front to rear—right bank, 1-2-3-4; left bank, 5-6-7-8.

The valves on the right bank are arranged from front to rear, I-E-I-E-I-E-I-E.

The valves on the left bank are arranged from front to rear, E-I-E-I-E-I-E-I.

1. Disconnect the brown lead (I terminal) and the red and blue lead (S terminal) at the starter relay. Install an auxiliary starter switch between the battery and S terminals of the starter relay. **Crank the engine with the ignition switch OFF.**

2. Make three chalk marks on the crankshaft damper (Fig. 16). Space the marks approximately 90° apart so that with the timing mark, the damper is divided into four equal parts (90° represents 1/4 of the distance around the damper circumference).

3. Rotate the crankshaft until No. 1 piston is on TDC at the end of the compression stroke. **Check the break-away torque (torque required to turn nut in a counterclockwise direction)** of the No. 1 intake and exhaust stud nuts. Replace the stud nut if the break-away torque does not meet specifications. If the break-away torque still is not within specifications, replace the stud.

4. With No. 1 piston on TDC at the end of the compression stroke, adjust the intake and exhaust valve clearance for No. 1 cylinder. Loosen the rocker arm stud nut until there is end clearance in the push rod, then tighten the nut to just remove all the push rod to rocker arm

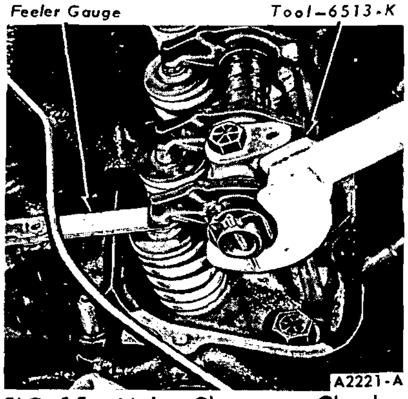


FIG. 15—Valve Clearance Check—170 and 200 Six

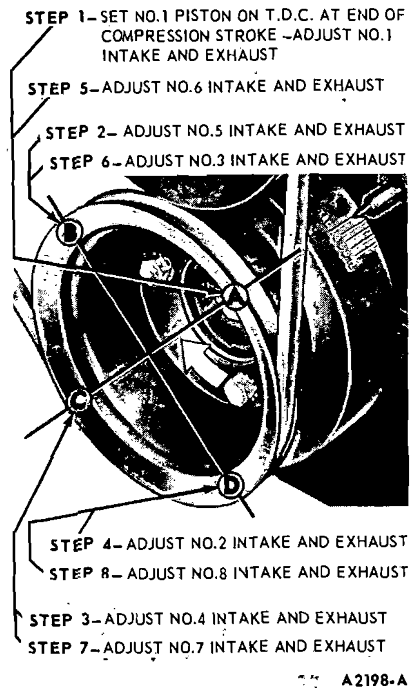


FIG. 16—289 V-8 Valve Clearance Adjustment Points

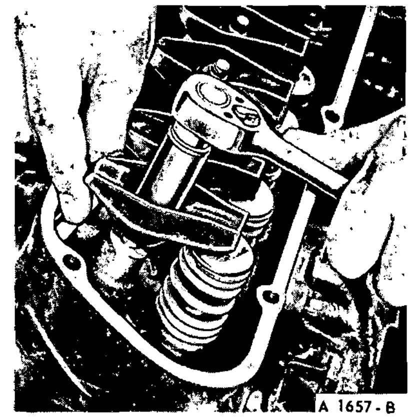


FIG. 17—Typical Valve Clearance Adjustment—289 V-8

FIG. 18—Typical Valve Clearance Check—289 V-8

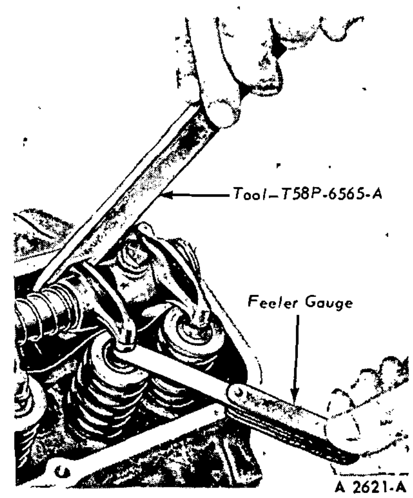


FIG. 19—390 V-8 Valve Clearance

clearance. This may be determined by rotating and/or moving the push rod with the fingers as the stud nut is tightened (Fig. 17). When the push rod to rocker arm clearance has been eliminated, tighten the stud nut an additional 3/4 turn to place the hydraulic lifter plunger in the desired operating range.

5. Repeat this procedure for the remaining set of valves, turning the crankshaft with an auxiliary starter switch, 1/4 turn at a time, in the direction of rotation, while adjusting the valves in the firing order sequence. The firing order is 1-5-4-2-6-3-7-8.

An alternate method is to remove the distributor cap and turn the crankshaft with an auxiliary starter switch until the breaker points are on the next peak of the distributor cam lobe. When the breaker points are on the next distributor cam lobe, the valves for the cylinder next in the firing order can be adjusted.

These procedures require two complete turns of the crankshaft.

6. Operate the engine and check for rough engine idle or a noisy lifter(s). Valve clearance set too tight will cause rough engine idle, and valve clearance set too loose will cause a noisy lifter(s).

Alternate Procedure

Position the piston(s) on TDC after the compression stroke (See Step 2 above). Apply pressure to slowly bleed down the valve lifter until the plunger is completely bottomed (Fig. 18). While holding the valve lifter in the fully collapsed position, check the available clearance with a feeler gauge between the rocker arm and valve stem tip (Fig. 18). The feeler gauge width must not exceed 3/8-inch. If the clearance is not within specifications, rotate the rocker arm stud nut clockwise to decrease the clearance and counterclockwise to increase the clearance. **Normally one turn of the rocker arm stud will vary the clearance by 0.006 inch:**

VALVE CLEARANCE—HYDRAULIC VALVE LIFTERS, 390 V-8

The valve arrangement is E-I-E-I-I-E-I-E from front to rear on both cylinder banks.

A 0.060-inch shorter push rod or a 0.060-inch longer push rod are available for service to provide a means of compensating for dimensional changes in the valve mechanism. Refer to the Master Parts List or the specifications for the pertinent color code.

Valve stem to valve rocker arm clearance should be within specifications with the hydraulic lifter completely collapsed. Repeated valve reconditioning operations (valve and/or valve seat refacing) will decrease the clearance to the point that, if not compensated for, the hydraulic valve lifter will cease to function.

To determine whether a shorter or a longer push rod is necessary, make the following check:

1. **Disconnect the brown lead (I terminal) and the red and blue lead (S terminal) at the starter relay.** Install an auxiliary starter switch between the battery and S terminals of the starter relay. **Crank the engine with the ignition switch OFF.**

2. **Position the crankshaft as outlined in steps 3 and 4.** Position the hydraulic lifter compressor tool on the rocker arm and slowly apply pressure to bleed down the hydraulic lifter until the plunger is completely bottomed (Fig. 19). Hold the lifter in the fully collapsed position and check the clearance between the valve stem and the rocker arm with a feeler gauge. If the clearance is within the specified limits (Part 8-5), a standard length push rod may be used. If the clearance is less than specified, replace the standard push rod with a shorter service push rod. If the clearance exceeds the specified amount, the operating range of the lifter is excessive, which indicates that the incorrect push rod has been installed or severe wear has occurred at the push rod ends, rocker arm, or valve stem. In this case, it will be necessary to determine the area of discrepancy, and the incorrect or defective part(s) should be replaced. If all the valve train components except the push rod are within limits, install a 0.060-inch longer push rod.

3. Rotate the crankshaft until No. 1 piston is on TDC at the end of the compression stroke and check the following valves:

No. 1 Intake	No. 1 Exhaust
No. 3 Intake	No. 4 Exhaust
No. 7 Intake	No. 5 Exhaust
No. 8 Intake	No. 8 Exhaust

4. After these valves have been checked, rotate the crankshaft 360° (one revolution) to position No. 6 piston on TDC and check the following valves:

No. 2 Intake	No. 2 Exhaust
No. 4 Intake	No. 3 Exhaust
No. 5 Intake	No. 6 Exhaust
No. 6 Intake	No. 7 Exhaust

When compressing the valve spring to remove the push rods, be sure the piston in the individual cylinder is below TDC to avoid contact between the valve and the piston.

To replace a push rod, it will be necessary to remove the valve rocker arm shaft assembly, following the procedure in Part 8-4.

Upon replacement of a valve push rod and/or valve rocker arm shaft assembly, the engine should not be cranked or rotated until the hydraulic lifters have had an opportunity to leak down to their normal operating position. The leakdown rate can be accelerated by using the tool shown in Fig. 19 on the valve rocker arm and applying pressure in a direction to collapse the lifter.

VALVE LASH—MECHANICAL TAPPETS, 289 HIGH PERFORMANCE V-8

It is important that the valve lash be held to the correct specifications. If the lash is set too close, the valve will open too early and close too late, resulting in rough engine idle. Burning and warping of the valves will occur also because the valves cannot make firm contact with the seats long enough to cool properly. If the lash is excessive, it will cause the valve to open too late and close too early causing valve bounce. In addition, damage to the camshaft lobe is likely because the tappet foot will not follow the pattern of the camshaft lobe, causing a shock contact between these two parts.

Preliminary (Cold)

If the valve rocker arm(s) has been removed and installed, it will be necessary to make a preliminary (cold) valve lash adjustment before starting the engine. If the adjustment is made for an engine tune-up, follow the final (hot) adjustment procedure.

1. Follow steps 1 thru 3 under Valve Clearance—Hydraulic Valve Lifters, 289 Regular V-8.

2. With the No. 1 piston on TDC at the end of the compression stroke, adjust the intake and exhaust valve lash to the specified cold setting.

3. Follow step 5 under Valve Clearance—Hydraulic Valve Lifters, 289 Regular V-8.

Final (Hot)

1. Be sure the engine is at normal operating temperature before attempting to set the valve lash.

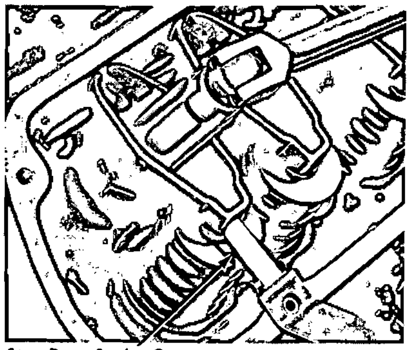


FIG. 20—Final Valve Lash Adjustment—289 High Performance V-8

2. With the engine idling, set the valve lash (Fig. 20) using a step-type feeler gauge only (GO and NO GO). The final (hot) intake and exhaust valve lash settings are listed in the Specification Section.

For example, to obtain the correct setting if the valve lash is 0.019 inch, use a step-type gauge of 0.018 inch (GO) and 0.020 inch (NO GO). The GO step should enter, and the NO GO step should not enter. The resultant setting will be to the required setting (0.019 inch).

VALVE LASH-MECHANICAL TAPPETS—427 V-8

It is important that the valve lash be held to the correct specifications. If the lash is set too close, the valve will open too early and close too late, resulting in rough engine idle. Burning and warping of the valves will occur also because the valves cannot make firm contact with the seats long enough to cool properly. If the lash is excessive, it will cause the valve to open too late and close too early causing valve bounce. In addition, damage to the camshaft lobe is likely because the tappet foot will not follow the pattern of the camshaft lobe, causing a shock contact between these two parts.

Preliminary (Cold)

If some component of the valve train has been replaced; i.e., rocker arm, push rod, camshaft, etc., it will be necessary to make a preliminary (cold) valve lash adjustment before starting the engine. If the valve lash adjustment is made for an engine tune-up, follow the final (hot) adjustment procedure.

On V-8 engines the cylinders are numbered from front to rear—right bank, 1-2-3-4; left bank, 5-6-7-8.

On the 427 V-8 engine, the valves are arranged from front to rear on both banks, E-I-E-I-I-E-I-E.

1. Check the torque required to turn the screw. If the torque required to turn a screw is less than 7 ft-lbs (84 in-lbs), try an oversize self-locking adjusting screw. If this is still unsatisfactory, replace the rocker arm and adjusting screw.

2. **Disconnect the brown lead (I terminal) and the red and blue lead (S terminal) at the starter relay.** Install an auxiliary starter switch between the battery and S terminals of the starter relay. **Crank the engine with the ignition switch OFF.**

3. On the 427 V-8 engine, make three chalk marks on the crankshaft damper (Fig. 21). Space the marks approximately 90° apart so that with the timing mark, the damper is divided into four equal parts (90° represents 1/4 of the distance around the damper circumference). Set the intake and exhaust valve lash (Fig. 22) to specifications with a step-type feeler gauge (go and no go).

Rotate the crankshaft until No. 1 piston is near TDC at the end of the compression stroke. Adjust the following valves:

No. 1 Exhaust	No. 1 Intake
No. 4 Exhaust	No. 7 Intake
No. 5 Exhaust	No. 8 Intake

Rotate the crankshaft 180° or 1/2 turn in the direction shown in Fig. 21 (this puts No. 4 piston on TDC). Adjust the following valves:

No. 2 Exhaust	No. 4 Intake
No. 6 Exhaust	No. 5 Intake

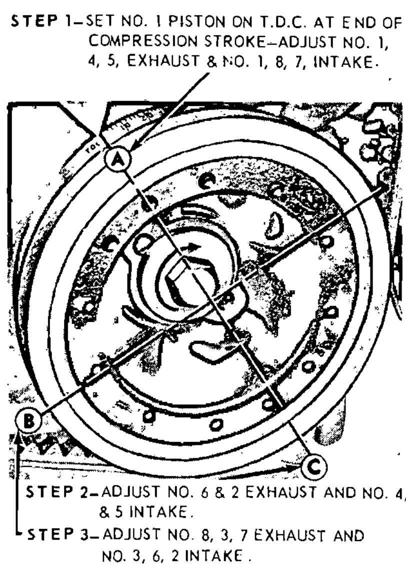


FIG. 21—Preliminary Valve Lash Adjustment

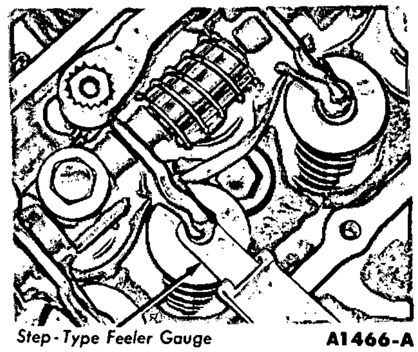


FIG. 22—Valve Lash Adjustment—Mechanical Valve Lifters

Rotate the crankshaft another 3/4 turn in the same direction (this puts No 3 piston on TDC). Adjust the following valves:

No. 3 Exhaust	No. 2 Intake
No. 7 Exhaust	No. 3 Intake
No. 8 Exhaust	No. 6 Intake

Final (Hot)

1. Be sure the engine is at normal operating temperature before attempting to set the valve lash.

2. With the engine idling, set the valve lash (Fig. 22) using a step-type feeler gauge only (go and no go). The final (hot) intake and exhaust valve lash settings are listed in the Specifications (Part 8-5).

For example, to obtain the correct setting if the valve lash is 0.025 inch, use a step-type feeler gauge of 0.024 inch (go) and 0.026 inch (no go). The go step should enter, and the no go step should not enter. The resultant setting will be to the required setting (0.025 inch).

REPAIRS

VALVE ROCKER ARM AND/OR SHAFT ASSEMBLY

Dress up minor surface defects on the rocker arm shaft and in the rocker arm bore with a hone.

If the pad at the valve end of the rocker arm has a grooved radius, replace the rocker arm. **Do not attempt to true this surface by grinding.**

For a 289 V-8 engine, refer to Cylinder Head Repair for the rocker arm stud replacement procedure.

PUSH RODS

Following the precedures in Section 3 under Push Rod Inspection check the push rods for straightness.

If the runout exceeds the maximum limit at any point, discard the

rod. **Do not attempt to straighten push rods.**

CYLINDER HEADS

Replace the head if it is cracked. **Do not plane or grind more than 0.010 inch from the cylinder head gasket surface.** Remove all burrs or scratches with an oil stone.

Rocker Arm Stud Nut Replacement—289 V-8

If the rocker arm stud nut breakaway torque is less than specified, install a new standard stud nut and recheck the breakaway torque. Refer to Valve Clearance Adjustment for the torque procedure.

Rocker Arm Stud Replacement—289 Regular V-8

If it is necessary to remove a rocker arm stud, a rocker arm stud kit (tool T62F-6A527-B) is available which contains the following: a stud remover, a 0.006-inch O.S. reamer, and a 0.015-inch O.S. reamer. For 0.010 inch oversize studs, use reamer T66P-6A527-B. Use stud replacer T65P-6A527-A to press in replacement studs.

Rocker arm studs that are broken or have damaged threads may be replaced with standard studs. Loose studs in the head may be replaced with 0.006, 0.010 or 0.015-inch oversize studs which are available for service.

Standard and oversize studs can be identified by measuring the stud diameter within 1 1/8 inch from the pilot end of the stud. The stud diameters are:

Standard..........0.3714—0.3721
0.006 oversize...0.3774—0.3781
0.010 oversize...0.3814—0.3821
0.015 oversize...0.3864—0.3871

When going from a standard size rocker arm stud to a 0.010 or 0.015-inch oversize stud, always use the 0.006-inch oversize reamer before finish reaming with the 0.010 or 0.015-inch oversize reamer.

1. Position the sleeve of the rocker arm stud remover (tool T62F-6A527-B) over the stud with the bearing end down. Thread the puller into the sleeve and over the stud until it is fully bottomed. Hold the sleeve with a wrench; then rotate the puller clockwise to remove the stud (Fig. 23).

If the rocker arm stud was broken

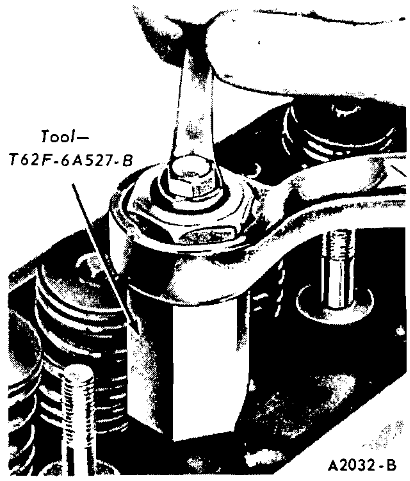


FIG. 23—Rocker Arm Stud Removal

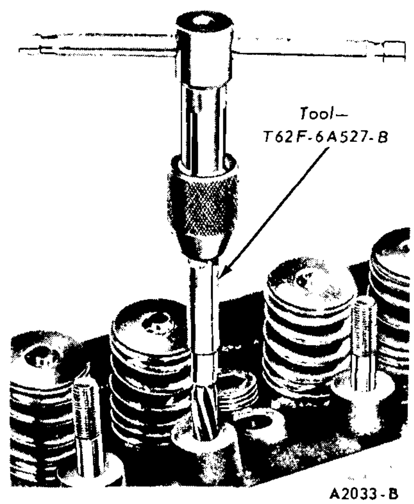


FIG. 24—Reaming Rocker Arm Stud Bore

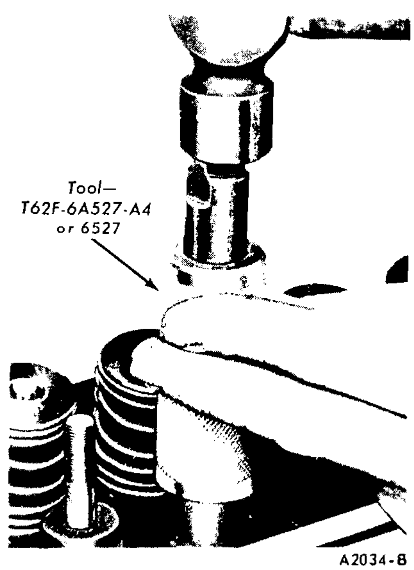


FIG. 25—Rocker Arm Stud Installation

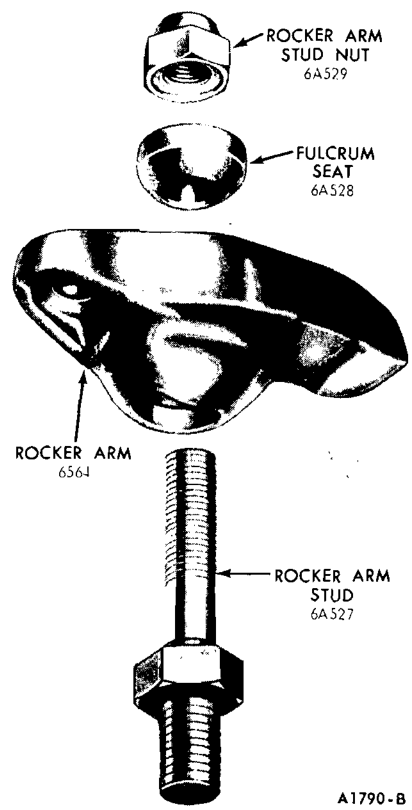


FIG. 26—Valve Rocker Arm and Stud Assembly

off flush with the stud boss, use an easy-out to remove the broken stud following the instructions of the tool manufacturer.

2. If a loose rocker arm stud is being replaced, ream the stud bore using the proper reamer (or reamers in sequence) for the selected oversize stud (Fig. 24). **Make sure the metal particles do not enter the valve area.**

3. Screw the new stud into the sliding driver of the rocker arm stud installer (tool T65P-6A527-A) and coat the end of the stud with Lubriplate. Align the stud and installer with the stud bore; then tap the sliding driver until it bottoms (Fig. 25). When the installer contacts the stud boss, the stud is installed to its correct height.

Valve Rocker Arm Stud Replacement—289 High Performance V-8

The valve rocker arm and stud assembly is shown in Fig. 26.

Removal

1. Remove the air cleaner.
2. Disconnect the spark plug wires at the spark plugs. Remove the wires from the bracket(s) on the

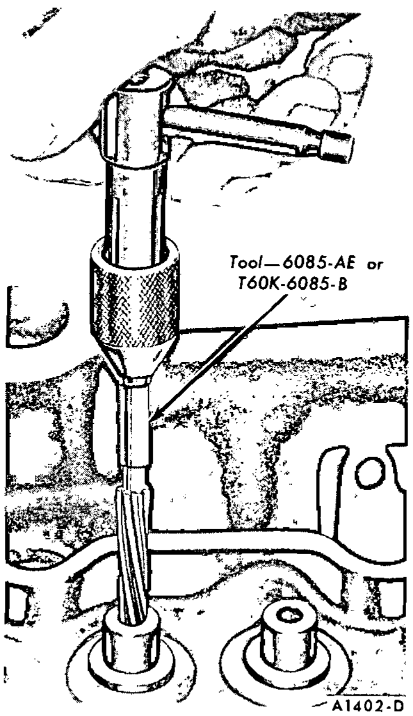


FIG. 27—Reaming Valve Guides

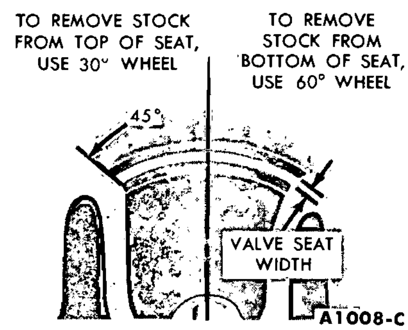


FIG. 28—Valve Seat Refacing

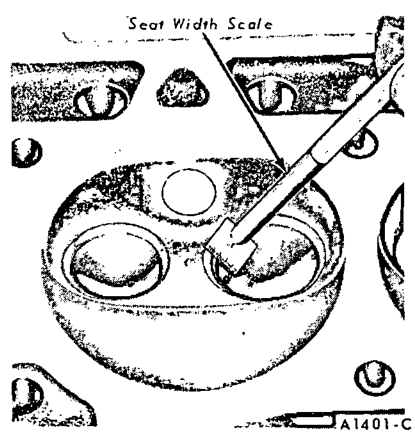


FIG. 29—Valve Seat Width

rocker arm cover(s) and position the wires out of the way.

3. If a rocker arm and stud is being removed from the right cylinder head, pull the regulator valve out of the rubber grommet and position the hose and valve out of the way. Also remove the automatic choke heat tube.

4. Remove the valve rocker arm cover(s).

5. Remove the valve rocker arm stud nut, fulcrum seat, and rocker arm.

6. Remove the rocker arm stud.

Installation

1. Apply light engine oil to the rocker arm stud threads (side that screws into the head only). Install the rocker arm stud and torque to specifications.

2. Apply Lubriplate to the top of the valve stem and at the push rod guide in the cylinder head.

3. Install the valve rocker arm, fulcrum seat, and stud nut. Perform a preliminary (cold) valve lash adjustment.

4. Temporarily lay the valve rocker arm covers in place and connect the spark plug wire to the spark plugs. Operate the engine at 1200 rpm for 30 minutes to stabilize engine temperatures. Remove the valve rocker arm covers and perform a hot valve lash adjustment with the engine idling.

5. Clean the valve rocker arm cover(s) and the cylinder head gasket surface. Apply oil-resistant sealer to one side of a new cover gasket(s). Lay the cemented side of the gasket(s) in place in the cover(s).

6. Position the cover(s) on the cylinder head(s). Make sure that the gasket seats evenly around the head. Install the valve cover bolts. Torque the bolts to specifications. Two minutes later, torque the bolts to the same specifications.

If the right valve rocker arm cover was removed, install the automatic choke heat tube and the crankcase ventilation regulator valve.

Reaming Valve Guides

If it becomes necessary to ream a valve guide (Fig. 27) to install a valve with an oversize stem, a reaming kit is available which contains the following reamer and pilot combinations: a 0.003-inch O.S. reamer with a standard diameter pilot, a 0.015-inch O.S. reamer with a 0.003-inch O.S. pilot, and a 0.030-inch reamer with a 0.015-inch O.S. pilot.

When going from a standard size valve to an oversize valve, always use the reamers in sequence. **Always reface the valve seat after the valve guide has been reamed, and use a suitable scraper to break the sharp corner (I.D.) at the top of the valve guide.**

Refacing Valve Seats

Refacing of the valve seats should be closely co-ordinated with refacing of the valve face so that the finished seat and valve face will be concentric and the specified interference fit will be maintained. This is important so that the valve and seat will have a compression tight fit. Be sure that the refacer grinding wheels are properly dressed.

Grind the valve seats to a true 45° angle (Fig. 28). Remove only enough stock to clean up pits, grooves, or to correct the valve seat runout. After the seat has been refaced, use a seat width scale to measure the seat width (Fig. 29). Narrow the seat, if necessary, to bring it within specifications.

If the valve seat width exceeds the maximum limit, remove enough stock from the top edge and/or bottom edge of the seat to reduce the width to specifications (Fig. 28).

Use a 30° angle grinding wheel to remove stock from the top of the seats (lower the seats) and use a 60° angle wheel to remove stock from the bottom of the seats (raise the seats).

The finished valve seat should contact the approximate center of the valve face. It is good practice to determine where the valve seat contacts the face. To do this, coat the seat with Prussian blue, then set the valve in place. Rotate the valve with light pressure. If the blue is transferred to the center of the valve face, the contact is satisfactory. If the blue is transferred to the top edge of the valve face, lower the valve seat. If the blue is transferred to the bottom edge of the valve face, raise the valve seat.

VALVES

For inspection procedures refer to Section 3.

Valve defects, such as minor pits, grooves, etc., may be removed. Discard valves that are severely damaged, or if the face runout or stem clearance exceeds specifications.

Refacing Valves

The valve refacing operation should be closely co-ordinated with the

valve seat refacing operation so that the finished angles of the valve face and of the valve seat will provide a compression-tight fit. Be sure that the refacer grinding wheels are properly dressed.

If the valve face runout is excessive and/or to remove pits and grooves, reface the valves to a true 44° angle. Remove only enough stock to correct the runout or to clean up the pits and grooves. If the edge of the valve head is less than 1/32 inch thick after grinding, replace the valve as the valve will run too hot in the engine. **The interference fit of the valve and seat should not be lapped out.**

Remove all grooves or score marks from the end of the valve stem, and chamfer it as necessary. Do not remove more than 0.010 inch from the end of the valve stem. **The valve stem from the valve lock groove to the end (Fig. 39), must not be shorter than the minimum specified length.**

If the valve and/or valve seat has been refaced, it will be necessary to check the clearance between the rocker arm pad and the valve stem with the valve train assembly installed in the engine.

Select Fitting Valves

If the valve stem to valve guide clearance exceeds the wear limit, ream the valve guide for the next oversize valve stem. Valves with oversize stem diameters of 0.003, 0.015 and 0.030 inch are available for service. **Always reface the valve seat after the valve guide has been reamed.** Refer to Reaming Valve Guides.

CAMSHAFT

Remove light scuffs, scores or nicks from the camshaft machined surfaces with a smooth oil stone.

CRANKSHAFT

Dress minor imperfections with an oil stone. If the journals are severely marred or exceed the wear limit, they should be refinished to size for the next undersize bearing.

Refinishing Journals

Refinish the journal to give the proper clearance with the next undersize bearing. If the journal will not clean up to give the proper clearance with the maximum undersize bearing available, replace the crankshaft.

Always reproduce the same journal shoulder radius that existed originally. Too small a radius will result in fatigue failure of the crankshaft. Too large a radius will result in bearing failure due to radius ride of the bearing.

After refinishing the journals, chamfer the oil holes, then polish the journal with a No. 320 grit polishing cloth and engine oil. Crocus cloth may be used also as a polishing agent.

PISTONS, PINS AND RINGS

Fitting Pistons

Pistons are available for service in standard sizes and the oversizes shown in Fig. 30.

The standard-size pistons are color coded red or blue on the dome. Refer to the specifications for the standard-size piston dimensions. Piston pins and retainers are provided with new pistons, except retainers are not used on the 170 and 200 Six and 289 V-8.

Follow the procedures in Section 3 to measure the piston O.D. and cylinder bore I.D. The dimensions should be within specifications, and the piston to bore clearance (bore I.D. minus piston O.D.) must be within the specified limits.

If the clearance is greater than the maximum limit, recheck calculations to be sure that the proper size piston has been selected, check for a damaged piston; then, try a new piston.

If the clearance is less than the minimum limit, recheck calculations before trying another piston. If none can be fitted, refinish the cylinder to provide the proper clearance for the piston.

When a piston has been fitted, mark it for assembly in the cylinder to which it was fitted.

If the taper, out-of-round and piston to cylinder bore clearance conditions of the cylinder bore are within specified limits, new piston rings will give satisfactory service. If the new rings are to be installed in a used cylinder that has not been refinished, remove the cylinder wall glaze. Be sure to clean the cylinder bore thoroughly, following the procedure in Section 3.

To Fit a Piston:

1. Calculate the size piston to be used by taking a cylinder bore check. Follow the procedures outlined in Section 3.

2. Select the proper size piston to provide the desired clearance (refer to the specifications). Measure the piston diameter in line with the centerline of the piston pin and at 90° to the piston pin axis.

3. Make sure the piston and cylinder block are at room temperature (70° F). **After any refinishing operation, allow the cylinder bore to cool and make sure the piston and bore are clean and dry before the piston fit is checked.**

Engine	Piston Oversize (inches)
170 Six	0.003, 0.020 0.030, 0.040, 0.060
200 Six 289, 390 V-8 (2-V and 4-V)	0.003, 0.020, 0.030, 0.040
289 High Performance V-8	Standard Only
427 V-8	Standard Only

FIG. 30—Oversize Service Pistons

Fitting Piston Rings

1. Select the proper ring set for the size piston to be used.

2. Position the ring in the cylinder bore in which it is going to be used.

3. Push the ring down into the bore area where normal ring wear is not encountered.

4. Use the head of a piston to position the ring in the bore so that the ring is square with the cylinder wall. **Use caution to avoid damage to the ring or cylinder bore.**

5. Measure the gap between the ends of the ring with a feeler gauge (Fig. 31). If the ring gap is less or greater than the specified limits, try another ring set.

6. Check the ring side clearance of the compression rings with a feeler gauge inserted between the ring and its lower land (Fig. 32). The gauge should slide freely around the entire ring circumference without binding. Any wear that occurs will form a step at the inner portion of the lower land. **If the lower lands have high steps, the piston should be replaced.**

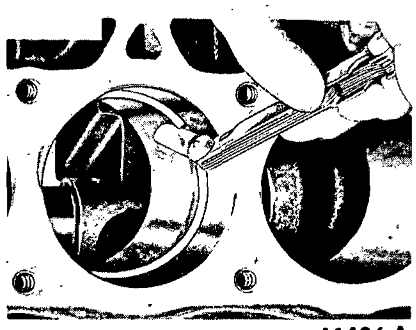


FIG. 31—Piston Ring Gap

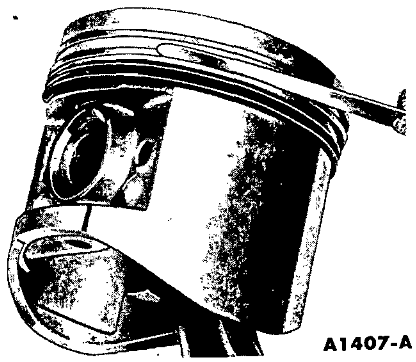


FIG. 32—Ring Side Clearance

Fitting Piston Pins

On the 390 or 427 V-8, the piston pin should be a light thumb press fit at normal temperature (70° F). Standard piston pins are color coded green. Pins of 0.001-inch oversize (color coded blue) and 0.002-inch oversize (color coded yellow) are available.

Install the piston pin in the piston and rod. Install a new retainer at each end of the pin to hold it in place. Make sure the retainers are properly seated in their grooves.

On the 170 and 200 Six or 289 V-8, install the piston pin, following the procedure under Piston Assembly (Part 8-2 or 8-3).

If the pin hole in the piston must be reamed or honed use precision honing equipment or an expansion-type piloted reamer. **Piston pin bores must not be reamed with hand-driven reamers. Use motor-driven reamers, but do not exceed the cutting speed (rpm) recommended by the reamer manufacturer.**

If a reamer is used, set the reamer to the size of the pin bore; then expand the reamer slightly and trial ream the pin bore. Take a light cut. Use a pilot sleeve of the nearest size to maintain alignment of the bores.

Check the hole size, using the new piston pin. If the bore is small, expand the reamer slightly and make another cut. Repeat the procedure until the proper fit is obtained. Check the piston pin for fit in the respective rod or rod bushing if necessary, ream or hone the rod bushing to fit the pin to specifications.

THERMACTOR AIR SUPPLY PUMP

The air supply pump and component parts are shown in Fig. 33.

Disassembly

1. Position the air supply pump in a vise with the pulley hub between the vise jaws and the pump assembly above the vise. **Do not mount the pump housing in a vise.**
2. Remove the cover bolts. Use a plastic (or rawhide) hammer to tap the cover assembly off the dowel pins. Then pull the cover assembly off the pump by hand.
3. Remove the rotor ring screws

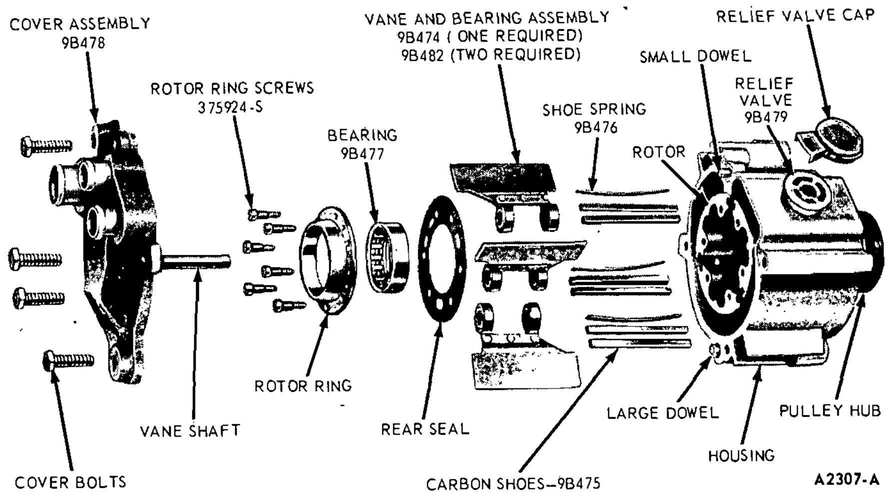


FIG. 33—Thermactor System Air Supply Pump— Exploded View

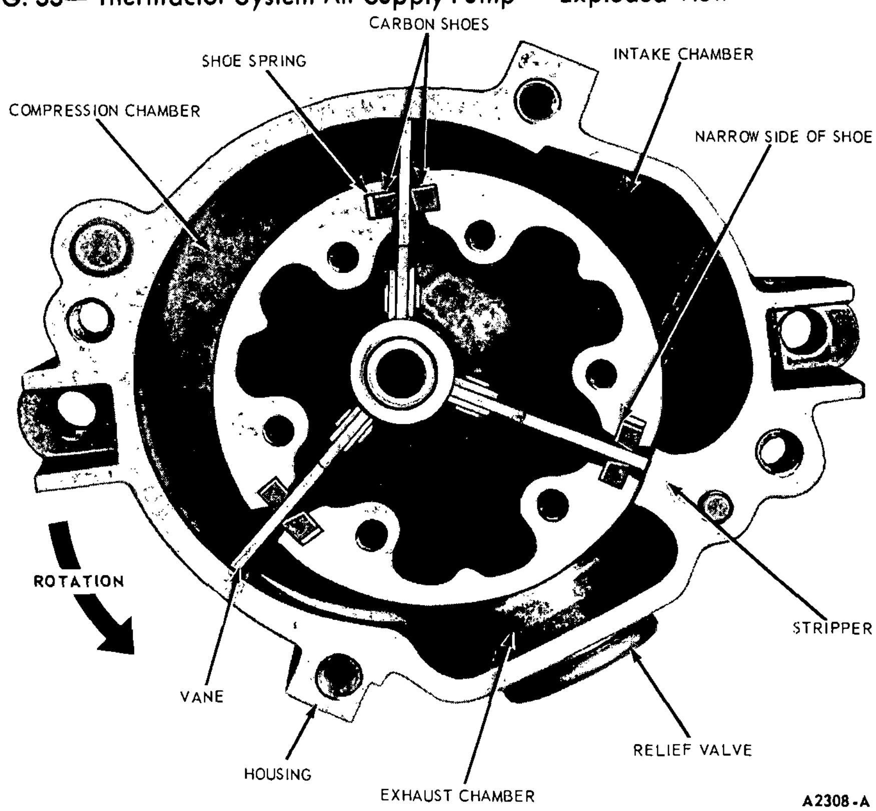


FIG. 34—Vanes, Carbon Shoes and Springs Installed in Rotor

and remove the rotor ring and bearing assembly. Remove the rear seal. This is a carbon seal and it should be replaced whenever the pump is disassembled.

4. Locate the vane (Fig. 34) that is attached to the bearing nearest the cover assembly (rear of pump). Grasp it with the fingers and pull it as far as possible out of the rotor. Then pull the other vanes out as far as possible. Alternately pull each vane until they are free of the rotor. If the carbon shoes and shoe springs move out of the rotor as the vanes are being removed, push down on the carbon shoe next to the shoe spring. Then remove the shoe spring. This will aid in removal of the vanes.

5. Use a pair of tweezers to remove the carbon shoes. If needle-nosed pliers are used to remove the carbon shoes, **do not pinch the shoes with the pliers too tightly as the carbon is easily crushed.**

6. If the bearing in the rotor ring requires replacement, position the rotor ring on Tool T66L-9A486-AB with the bearing part number facing upwards. Place Tool T66L-9A486-AA on the bearing and use an arbor press to remove the bearing.

Further disassembly of the rotor from the housing is not recommended. If any components of the housing assembly require replacement, the entire housing must be replaced.

Cleaning and Inspection

Refer to Section 3 for the cleaning and inspection procedures.

Assembly

1. The rotor ring is a matched assembly with the housing and rotor assembly, thus these parts are replaceable as a unit only. If the rotor ring bearing was removed, use Tools T66L-9A486-AA and T66L-9A486-AB and press a new bearing into the rotor ring. **The part number side of the bearing should be on the same side of the rotor ring as the flat surface (side towards rotor)**, and the bearing should be flush to 1/32 inch below the surface of the ring.

2. Place the rotor and housing assembly in a vise with the vise jaws gripping the pulley hub. **Do not clamp the housing assembly in a vise.**

3. Lubricate the vane assembly bearings with only the special air pump bearing lubricant (refer to Group 21 for the lube specification) as follows:

Hold each vane assembly bearing over the vane assembly pin (Tool-T66L-9A486-C) with the pin just engaged in the bearing. Fill the inside of the bearing with bearing lubricant. Cover the open end of the bearing with the thumb or finger, and press the bearing onto the assembly pin. This will force the lubricant into and around the needle rollers of the bearing. Wipe off the excess grease. Repeat the procedure for the other vane bearings.

4. Mesh the bearings of the vane assemblies so that the ends of the vanes are even, and install the vanes in the rotor (Fig. 34).

5. Install the carbon shoes in the rotor. **One side of each shoe is not square with the other sides.** The shoes must be installed with the narrow edge towards the vane bearings as shown in Fig. 34 and the slant side against the vane.

6. Install the shoe springs between the rotor and shoe in front of the leading (counterclockwise rotation from rear of pump) face of each vane. **The springs must be installed with the tension at the ends of the spring against the rotor and the tension at the center of the spring against the shoe.**

Position the vanes with one vane against the stripper part of the housing as shown in Fig. 34.

7. Lubricate the rotor rear bearing (in the rotor ring) with air pump lubricant (refer to Group 21 for the specification). Coat the bearing surfaces with lubricant and work it into the bearing with the thumb or finger. Wipe the excess lubricant from the bearing and rotor ring assembly.

8. Position a new rear seal and the rotor ring and bearing assembly on the rotor. The rotor ring bolt holes are unevenly spaced to ensure the rotor ring being properly aligned with the rotor. Apply a thin coating of Loctite thread locking compound to the rotor ring attaching screws, and install the ring screws and torque to specifications.

9. Using the vane assembly pin (T66L-9A486-C), align the vane bearings. Remove the alignment tool.

10. Carefully align the cover assembly with the rotor and insert the vane shaft into the vane bearings. **Do not force the shaft into place, or the vanes will become misaligned.** It may be necessary to rotate the cover and shaft and/or wiggle it slightly from side to side while pushing inward.

Rotate the cover to align with the housing dowels, and push it onto the dowels.

11. Install the cover bolts and torque evenly and alternately in sequence to specifications.

THERMACTOR RELIEF VALVE REPLACEMENT

Do not disassemble the air pump to replace the relief valve, but remove it from the engine.

1. Position Tool T66L-9A486-D on the air pump and remove the relief valve with the aid of a slide hammer (T59L-100-B).

2. Position the relief valve on the pump housing and hold Tool T66L-9A486-B on the relief valve. Use a hammer to **tap the tool lightly** until the relief valve is seated.

CYLINDER BLOCK

Refinishing Cylinder Walls

Honing is recommended for refinishing cylinder walls only when the walls have minor imperfections, such as light scuffs and scratches, or for fitting pistons to the specified clearance. The grade of hone to be used is determined by the amount of metal to be removed. Follow the instructions of the hone manufacturer. If coarse stones are used to start the honing operation, leave enough material so that all hone marks can be removed with the finishing hone which is used to obtain the proper piston clearance.

Cylinder walls that are severely marred and/or worn beyond the specified limits should be refinished. Before any cylinder is refinished, all main bearing caps must be in place and tightened to the proper torque so that the crankshaft bearing bores will not become distorted from the refinishing operation.

Refinish only the cylinder or cylinders that require it. **All pistons are the same weight, both standard and oversize; therefore, various sizes of pistons can be used without upsetting engine balance.**

Refinish the cylinder with the most wear first to determine the maximum oversize. If the cylinder will not clean up when refinished for the maximum oversize piston recommended, replace the cylinder block.

Refinish the cylinder to within approximately 0.0015 inch of the required oversize diameter. This will allow enough stock for the final step of honing so that the correct surface finish and pattern are obtained.

For the proper use of the refinishing equipment follow the instructions of the manufacturer. **Only experienced personnel should be allowed to perform this work.**

Use a motor-driven, spring-pressure-type hone at a speed of 300-500

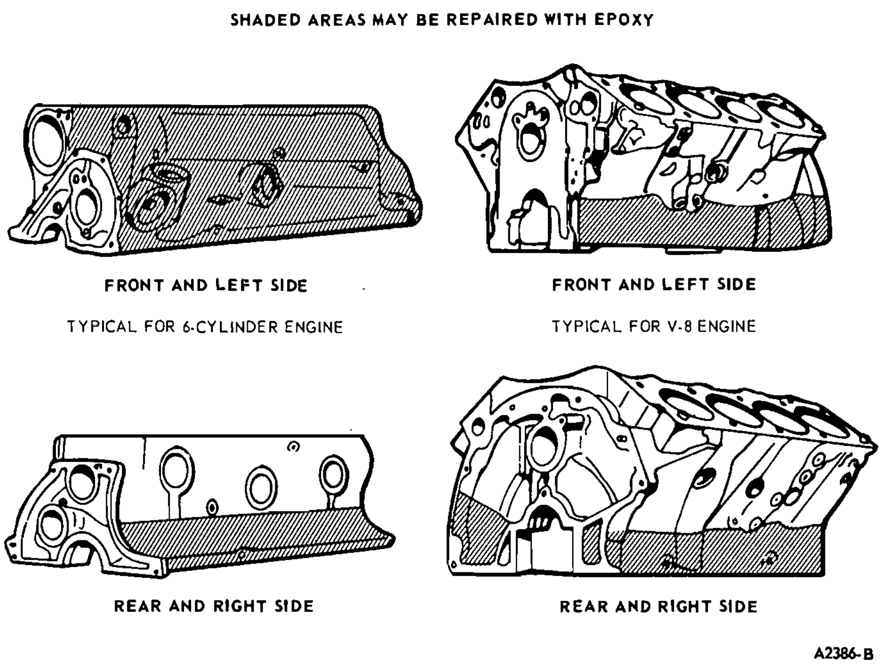


FIG. 35—Typical Cast Iron Cylinder Block Areas Repairable with Metallic Plastic

rpm. Hones of grit sizes 180-220 will normally provide the desired bore surface finish of 15/32 RMS. When honing the cylinder bores use a lubricant mixture of equal parts of kerosene and SAE No. 20 motor oil. Operate the hone in such a way to produce a cross-hatch finish on the cylinder bore. The cross hatch pattern should be at an angle of approximately 30 ° to the cylinder bore. After the final operation in either of the two refinishing methods described and prior to checking the piston fit, thoroughly clean and oil the cylinder walls, following the procedure in Section 3. Check the piston fit, following the procedure in this section and Section 3. Mark the pistons to correspond to the cylinders in which they are to be installed. When the refinishing of all cylinders that require it has been completed and all pistons are fitted, thoroughly clean the entire block and oil the cylinder walls following the procedure under Cylinder Block Cleaning in Section 3.

REPAIRING ENGINE CASTINGS WITH SAND HOLE(S) OR POROSITY

Porosity or sand hole(s) which will cause oil seepage or leakage can occur with modern casting processes. A complete inspection of engine and transmission should be made. If the leak is attributed to the porous condition of the engine block or sand hole(s) repairs can be made with metallic plastic (part No. C6AZ-19554-A). **Do not repair cracks with this material.** Repairs with this metallic plastic must be confined to those cast iron engine component surfaces (Fig. 35) where the inner wall surface is not exposed to engine coolant pressure or oil pressure, for example:

1. Cylinder block surfaces extending along the length of the block, upward from the oil pan rail to the cylinder water jacket but not including machined areas.
2. Lower rear face of the cylinder block.
3. Intake manifold casting. **Repairs are not recommended to the intake manifold exhaust crossover section,** since temperatures can exceed the recommended temperature limit of 500 ° F.
4. Cylinder front cover on engines using cast iron material.
5. Cylinder head, along the rocker arm cover gasket surface.

The following procedure should be used to repair porous areas or sand holes in cast iron.

1. Clean the surface to be repaired by grinding or rotary filing to a clean bright metal surface. Chamfer or undercut the hole or porosity to a greater depth than the rest of the cleaned surface. Solid metal must surround the hole. Openings larger than 1/4 inch should not be repaired using metallic plastic. Openings in excess of 1/4 inch can be drilled, tapped and plugged using common tools. Clean the repair area thoroughly. Metallic plastic will not stick to a dirty or oil surface.

2. Mix the metallic plastic base and hardener as directed on the container. Stir thoroughly until uniform.

3. Apply the repair mixture with a suitable clean tool, (putty knife, wood spoon, etc.) forcing the epoxy into the hole or porosity.

4. Allow the repair mixture to harden. This can be accomplished by two methods-heat cure with a 250 ° watt lamp placed 10 inches from the repaired surface, or air dry for 10-12 hours at temperatures above 50 ° F.

5. Sand or grind the repaired area to blend with the general contour of the surrounding surface.

6. Paint the surface to match the rest of the block.

FLYWHEEL RING GEAR—MANUAL-SHIFT TRANSMISSIONS

To replace a defective ring gear, heat the defective ring gear with a blow torch on the engine side of the gear, and knock it off the flywheel. **Do not hit the flywheel when removing the ring gear.**

Heat the new ring gear evenly until the gear expands enough to slip onto the flywheel. Make sure the gear is seated properly against the shoulder. **Do not heat any portion of the gear to a temperature higher than 500 ° F. If this limit is exceeded, the temper will be removed from the ring gear teeth.**

3 CLEANING AND INSPECTION

VALVE ROCKER ARM AND/OR SHAFT ASSEMBLY

CLEANING

Clean all the parts thoroughly. Make sure all oil passages are open.

On ball stud rocker arms, make sure the oil passage in the push rod end of the rocker arm is open.

INSPECTION

On rocker arm shaft assemblies, check the clearance between each

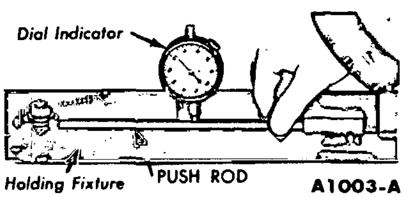


FIG. 36—Push Rod Runout

rocker arm and the shaft by checking the ID of the rocker arm bore and the OD of the shaft. If the clearance between any rocker arm and the shaft exceeds the wear limit, replace the shaft and/or the rocker arm. Inspect the shaft and the rocker arm bore for nicks, scratches, scores or scuffs.

Inspect the pad at the valve end of the rocker arm for indications of scuffing or abnormal wear. If the pad is grooved, replace the rocker arm. **Do not attempt to true this surface by grinding.**

On ball stud rocker arms, check the rocker arm and fulcrum seat for excessive wear, cracks, nicks or burrs. Check the rocker arm stud and nut for stripped or broken threads.

On a 289 High Performance V-8, check the rocker arm adjusting screws and the push rod end of the rocker arms for stripped or broken threads, and the ball end of the adjusting screw for nicks, scratches, or excessive wear.

The cleaning and inspection procedures in this section are for a complete engine overhaul; therefore, for partial engine overhaul or parts replacement, follow the pertinent cleaning or inspection procedure.

INTAKE MANIFOLD

CLEANING

Remove all gasket material from the machined surfaces of the manifold. Clean the manifold in a suitable solvent and dry it with compressed air.

INSPECTION

Inspect the manifold for cracks, damaged gasket surfaces, or other defects that would make it unfit for further service. Replace all studs that are stripped or otherwise damaged. **Remove all filings and foreign matter that may have entered the manifold as a result of repairs.**

On the 390 V-8 engine, check the baffle plate on the underside of the manifold; it should be securely fastened at all retaining points.

EXHAUST MANIFOLDS

CLEANING

Remove all gasket material from the manifolds. Make sure the automatic choke air inlet and outlet holes (right exhaust manifold on V-8 engines) are completely open and the cover does not leak.

Blow out the automatic choke air heat tube with compressed air.

INSPECTION

Inspect the cylinder head joining flanges of the exhaust manifold(s) for evidence of exhaust gas leaks.

Inspect the manifold(s) for cracks, damaged gasket surfaces, or other defects that would make them unfit for further service.

PUSH RODS

CLEANING

On a 289 V-8, clean the push rods in a suitable solvent. Blow out the oil passage in the push rods with compressed air.

INSPECTION

Check the ends of the push rods for nicks, grooves, roughness or excessive wear.

The push rods can be visually checked for straightness while they are installed in the engine by rotating them with the valve closed. They also can be checked with a dial indicator (Fig. 36).

If the push rod is visibly bent, it should be checked with a dial indicator. Refer to the specifications (Part 8-5) for the maximum allowable runout.

CYLINDER HEADS

CLEANING

On engines equipped with Thermactor exhaust emission control system, clean the air nozzle tips or cylinder head orifices with a wire brush. Clean the nozzle air hole or orifice with a 5/16-inch-diameter, stiff wire brush.

With the valves installed to protect the valve seats, remove deposits from the combustion chambers and valve heads with a scraper and a wire brush. **Be careful not to damage the cylinder head gasket surface.** After the valves are removed, clean the valve guide bores with a valve guide cleaning tool. Use cleaning solvent to remove dirt, grease and other deposits. Clean all bolt holes; be sure the oil transfer passage is clean.

Remove all deposits from the valves with a fine wire brush or buffing wheel.

INSPECTION

On engines equipped with a Thermactor exhaust emission control system, inspect the air nozzles or orifices for eroded, burned or damaged tips that would restrict the normal air flow. Inspect the connections for stripped or damaged threads and damaged tube nut seats. Inspect the cylinder heads for cracks or excessively burned areas in the exhaust outlet ports.

Check the cylinder head for cracks, and inspect the gasket surface for burrs and nicks. Replace the head if it is cracked.

The following inspection procedures are for a cylinder head that is to be completely overhauled. For individual repair operations, use only the pertinent inspection procedure.

Cylinder Head Flatness

When a cylinder head is removed because of gasket leaks, check the flatness of the cylinder head gasket surface (Fig. 37) for conformance to specifications.

If necessary to refinish the cylinder head gasket surface, **do not plane or grind off more than 0.010 inch.**

Valve Seat Runout

Check the valve seat runout with an accurate gauge (Fig. 38). Follow the instructions of the gauge manufacturer. If the runout exceeds the wear limit, reface the valve and valve seat.

Valve Seat Width

Measure the valve seat width (Fig. 29). Reface the valve seats if the width is not within specifications.

Valves

The critical inspection points and tolerances of the valves are illustrated in Fig. 39. Refer to the specifications for the wear limits. Inspect the valve face and the edge of the valve head

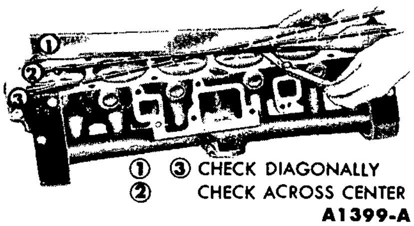


FIG. 37—Typical Cylinder Head Flatness

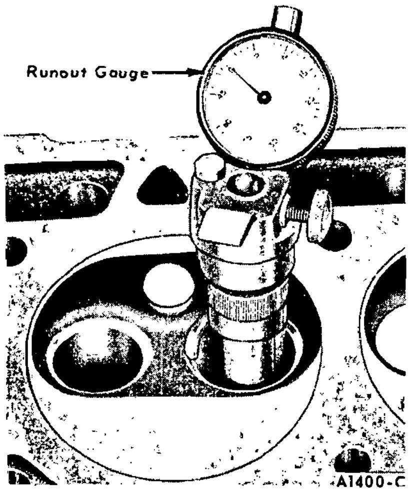


FIG. 38—Typical Valve Seat Runout

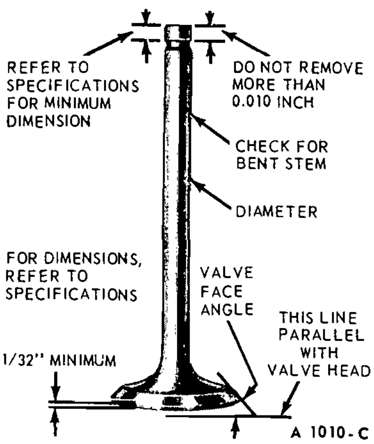


FIG. 39—Critical Valve Tolerances

for pits, grooves, scores or other defects. Inspect the stem for a bent condition and the end of the stem for grooves or scores. Check the valve head for signs of burning, erosion, warpage and cracking. Defects, such as minor pits, grooves, etc., may be removed. Discard valves that are severely damaged.

Inspect the valve springs, valve spring retainers, locks and sleeves for defects.

Valve Face Runout

Check the valve face runout (Fig.

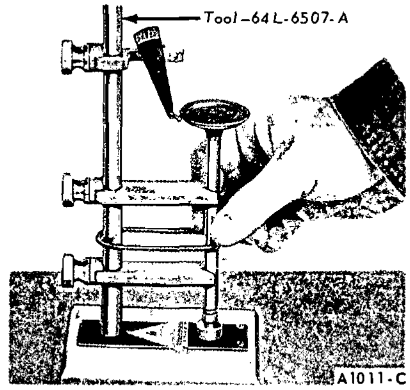


FIG. 40—Valve Face Runout

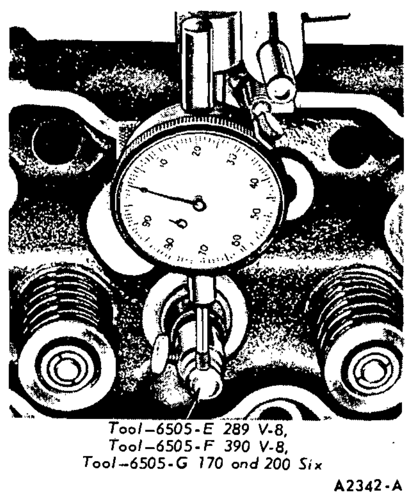


FIG. 41—Typical Valve Stem Clearance

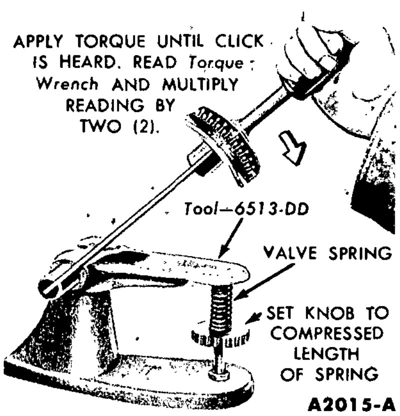


FIG. 42—Valve Spring Pressure

40). It should not exceed the specified wear limit. If the runout exceeds the wear limits, the valve should be refaced or replaced as outlined under Refacing Valves in Section 2.

Valve Stem Clearance

Check the valve stem to valve guide clearance of each valve in its respective

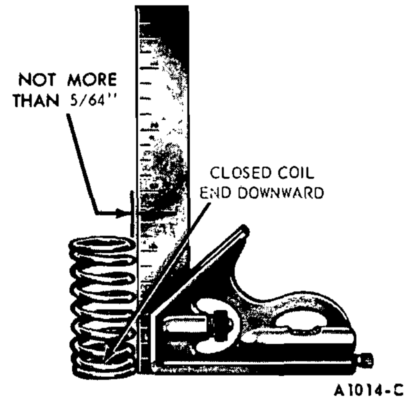


FIG. 43—Valve Spring Squareness

valve guide with the tool shown in Fig. 41 or its equivalent.

Install the tool on the valve stem until it is fully seated, and tighten the knurled set screw firmly. Permit the valve to drop away from its seat until the tool contacts the upper surface of the valve guide.

Position the dial indicator with its flat tip against the center portion of the tool's spherical section at approximately 90° to the valve stem axis. Move the tool back and forth in line with the indicator stem. Take a reading on the dial indicator without removing the tool from the valve guide upper surface. Divide the reading by two, the division factor for the tool.

Valve Spring Pressure

Check the springs for proper pressure (Fig. 42) at the specified spring lengths. Weak valve springs cause poor engine performance; therefore, if the pressure of any spring approaches the wear limit, replace the spring.

Valve Spring Squareness

Check each spring for squareness using a steel square and a surface plate (Fig. 43). Stand the spring and square on end on the surface plate. Slide the spring up to the square. Revolve the spring slowly and observe the space between the top coil of the spring and the square. If the spring is out of square more than 5/64 inch, replace it.

Follow the same procedure to check new valve springs before installation.

Make certain the proper spring (color coded) is installed.

Visually inspect the valve spring retainer to determine if the damper spring coil has been hitting the retainer. This interference will also cause a clicking noise when the

engine is operating. The damper spring is properly installed in the valve spring when positioned so that the end of the damper spring bottom coil is 135° counterclockwise from the end of the valve spring lower coil.

HYDRAULIC VALVE LIFTERS

The valve lifter assemblies should be kept in proper sequence so that they can be installed in their original position. Inspect and test each lifter separately so as not to intermix the internal parts. **If any part of the lifter assembly needs replacing, replace the entire assembly.**

CLEANING

Thoroughly clean all the parts in clean solvent and wipe them with a clean, lint-free cloth.

INSPECTION

Inspect the parts and discard the entire lifter assembly if any part shows pitting, scoring, galling, excessive wear or evidence of non-rotation. Replace the entire assembly if the plunger is not free in the body. The plunger should drop to the bottom of the body by its own weight when assembled dry.

Assemble the lifter assembly and check for freeness of operation by pressing down on the push rod cup. The lifters can also be checked with a hydraulic tester to test the leak down rate. Follow the instructions of the test unit manufacturer or the procedure in Section 1.

MECHANICAL TAPPETS

CLEANING

Thoroughly clean the tappets in clean solvent and wipe them with a clean, lint-free cloth.

INSPECTION

Inspect the tappets, and discard any that show signs of pitting, scoring or galling. Replace any tappets that show evidence of non-rotation.

TIMING CHAIN AND SPROCKETS

CLEANING

Clean all parts in solvent and dry them with compressed air.

Lubricate the timing chain with engine oil before installing it on the engine.

INSPECTION

Inspect the chain for broken links. Inspect the sprockets for cracks and worn or damaged teeth. Replace all components of the timing chain and sprocket assembly if any one item needs replacement.

FUEL PUMP ECCENTRIC

CLEANING

Clean the fuel pump eccentric in solvent and dry with compressed air.

INSPECTION

Inspect the fuel pump drive eccentric for scores, nicks and excessive wear. If the eccentric is scored, replace it.

CAMSHAFT

CLEANING AND INSPECTION

Clean the camshaft in solvent and wipe it dry. Inspect the camshaft lobes for scoring and signs of abnormal wear. Lobe wear characteristics may result in pitting in the general area of the lobe toe. This pitting is not detrimental to the operation of the camshaft; therefore, the camshaft should not be replaced until the lobe lift loss has exceeded 0.005 inch.

The lift of the camshaft lobes can be checked with the camshaft installed in the engine or on centers. Refer to Camshaft Lobe Lift.

Check the distributor drive gear for broken or chipped teeth.

CRANKSHAFT VIBRATION DAMPER AND SLEEVE

CLEANING

Clean the oil seal contact surface on the crankshaft damper or sleeve (390 V-8) with solvent to remove any corrosion, sludge or varnish deposits. Excess deposits that are not readily removed with solvent may be removed with crocus cloth. Use crocus cloth to remove any sharp edges, burrs or other imperfections which might damage the oil seal during installation or cause premature seal wear. **Do not use crocus cloth to the extent that the seal surface becomes polished. A finely polished surface may produce poor sealing or cause premature seal wear.**

INSPECTION

Inspect the crankshaft damper or sleeve (390 V-8) oil seal surface for nicks, sharp edges or burrs that might damage the oil seal during installation or cause premature seal wear.

CRANKSHAFT

CLEANING

Handle the crankshaft with care to avoid possible fractures or damage to the finished surfaces. Clean the crankshaft with solvent, then blow out all oil passages with compressed air.

INSPECTION

Inspect main and connecting rod journals for cracks, scratches, grooves or scores.

Measure the diameter of each journal in at least four places to determine out-of-round, taper or undersize condition (Fig. 44).

On engines used with a manual-shift transmission, check the fit of the clutch pilot bushing in the bore of the crankshaft. The bushing is pressed into the crankshaft and should not be loose. Inspect the inner surface of the bushing for wear or a bell-mouth condition. Check the ID of the bushing (Fig. 45). Replace the bushing if it is worn or damaged or the ID is not within specifications.

A VS B = VERTICAL TAPER
C VS D = HORIZONTAL TAPER
A VS C AND B VS D = OUT-OF-ROUND
CHECK FOR OUT-OF-ROUND AT EACH END OF JOURNAL

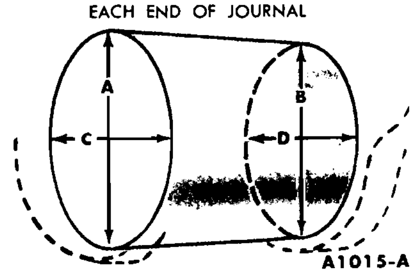


FIG. 44—Crankshaft Journal Measurements

Inspect the pilot bearing, when used, for roughness, evidence of overheating or loss of lubricant. Replace it if any of these conditions are found.

FLYWHEEL—MANUAL-SHIFT TRANSMISSIONS

INSPECTION

Inspect the flywheel for cracks, heat checks, or other defects that

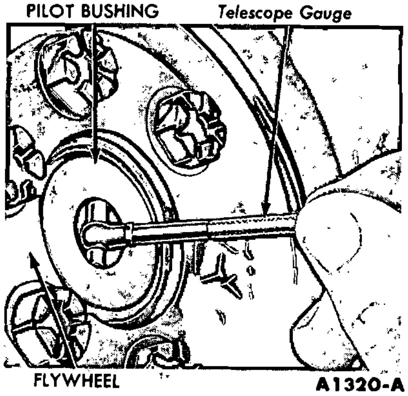


FIG. 45—Typical Clutch Pilot Bushing Wear Check

would make it unfit for further service. Machine the friction surface of the flywheel if it is scored or worn. If it is necessary to remove more than 0.045 inch of stock from the original thickness, replace the flywheel.

Inspect the ring gear for worn, chipped or cracked teeth. If the teeth are damaged, replace the ring gear.

With the flywheel installed on the crankshaft, check the flywheel face runout, following the procedure in Section 1.

FLYWHEEL—AUTOMATIC TRANSMISSIONS

INSPECTION

Inspect the flywheel for cracks or other defects that would make it unfit for further service. Inspect the starter ring gear for worn, chipped or cracked teeth. If the teeth are damaged, replace the ring gear and flywheel assembly.

With the flywheel installed on the crankshaft, check the gear face runout and outside diameter runout of the flywheel (refer to Section 1 for the proper procedure).

CONNECTING RODS

CLEANING

Remove the bearings from the rod and cap. Identify the bearings if they are to be used again. Clean the connecting rod in solvent, including the rod bore and the back of the inserts. **Do not use a caustic cleaning solution.** Blow out all passages with compressed air.

INSPECTION

The connecting rods and related parts should be carefully inspected and checked for conformance to specifications. Various forms of engine wear caused by these parts can be readily identified.

A shiny surface on the pin boss side of the piston usually indicates that a connecting rod is bent or the piston pin hole is not in proper relation to the piston skirt and ring grooves.

Abnormal connecting rod bearing wear can be caused by either a bent connecting rod, an improperly machined crankpin, or a tapered connecting rod bore.

Twisted connecting rods will not create an easily identifiable wear pattern, but badly twisted rods will disturb the action of the entire piston, rings and connecting rod assembly and may be the cause of excessive oil consumption.

Inspect the connecting rods for signs of fractures and the bearing bores for out-of-round and taper. If the bore exceeds the recommended limits and/or if the connecting rod is fractured, it should be replaced.

Check the piston pin to connecting rod bushing clearance. Replace the connecting rod if the bushing is so worn that it cannot be reamed or honed for an oversize pin.

On the 170 and 200 Six and 289 V-8, check the I.D. of the connecting rod piston pin bore. If the pin bore in the connecting rod is larger than specifications, install a 0.001 inch oversize piston pin. First, prefit the oversize piston pin to the piston pin bore by reaming or honing the piston to provide 0.0002—0.0004 inch clearance (light slip fit). Then, assemble the piston, piston pin and connecting rod following the procedures in Part 8-2 or 8-3. **It is not necessary to ream or hone the pin bore in the connecting rod.**

Replace defective connecting rod nuts and bolts.

If the connecting rod has been removed from the piston it should be checked for bend or twist before assembling it to the piston. Connecting rods can be checked for bend or twist while assembled to the piston. Check the connecting rods for bend or twist on a suitable alignment fixture. Follow the instructions of the fixture manufacturer. If the bend and/or twist exceeds specifications, the connecting rod must be straightened or replaced.

PISTONS, PINS AND RINGS

CLEANING

Remove deposits from the piston

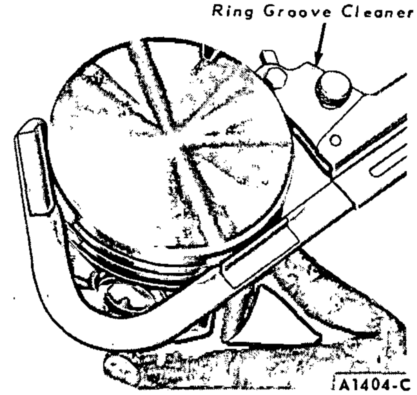


FIG. 46—Cleaning Ring Grooves —Typical

surfaces. Clean gum or varnish from the piston skirt, piston pins and rings with solvent. **Do not use a caustic cleaning solution or a wire brush to clean pistons.** Clean the ring grooves with a ring groove cleaner (Fig. 46). Make sure the oil ring slots (or holes) are clean.

INSPECTION

Carefully inspect the pistons for fractures at the ring lands, skirts and pin bosses, and for scuffed, rough or scored skirts. If the lower inner portion of the ring grooves has a high step, replace the piston. The step will interfere with ring operation and cause excessive ring side clearance.

Spongy, eroded areas near the edge of the top of the piston are usually caused by detonation or pre-ignition. A shiny surface on the thrust surface of the piston, offset from the centerline between the piston pin holes, can be caused by a bent connecting rod. Replace pistons that show signs of excessive wear, wavy ring lands or fractures or damage from detonation or pre-ignition.

Check the piston to cylinder bore clearance by measuring the piston and bore diameters. Refer to the specifications for the proper clearance. Refer to Cylinder Block Inspection for the bore measurement procedure. **Measure the O.D. of the piston with micrometers at the centerline of the piston pin bore and at 90° to the pin bore axis.**

Check the ring side clearance following the procedure under Fitting Piston Rings in Section 2.

Replace piston pins showing signs of fracture, etching or wear. Check the piston pin fit in the piston and rod. Refer to Pistons and Connecting Rods Assembly in the pertinent engine section.

Check the O.D. of the piston pin and the I.D. of the pin bore in the piston. Replace any piston pin or piston that is not within specifications.

Replace all rings that are scored, chipped or cracked. Check the end gap and side clearance. It is good practice to always install new rings when overhauling an engine. Rings should not be transferred from one piston to another regardless of mileage.

MAIN AND CONNECTING ROD BEARINGS

CLEANING

Clean the bearing inserts and caps thoroughly in solvent, and dry them with compressed air. **Do not scrape gum or varnish deposits from the bearing shells.**

INSPECTION

Inspect each bearing carefully. Bearings that have a scored, chipped or worn surface should be replaced. Typical examples of bearing failures and their causes are shown in Fig. 47. The copper lead bearing base may be visible through the bearing overlay. This does not mean that the bearing is worn. It is not necessary to replace the bearing if the bearing clearance is within recommended limits. Check the clearance of bearings that appear to be satisfactory with Plastigage. Fit new bearings following the recommended procedure in the pertinent part of Group 8.

CYLINDER BLOCK

CLEANING

After any cylinder bore repair operation, such as honing or deglazing, clean the bore(s) with soap or detergent and water. **Then, thoroughly rinse the bore(s) with clean water to remove the soap or detergent, and wipe the bore(s) dry with a clean, lint-free cloth. Finally, wipe the bore(s) with a clean cloth dipped in engine oil. If these procedures are not followed, rusting of the cylinder bore(s) may occur.**

If the engine is disassembled, thoroughly clean the block in solvent. Remove old gasket material from all machined surfaces. Remove all pipe plugs that seal oil passages; then clean out all the passages. Blow out all passages, bolt holes, etc., with compressed air.

On the 390 V-8, be sure the jiggle pin in the main oil gallery front plug operates freely.

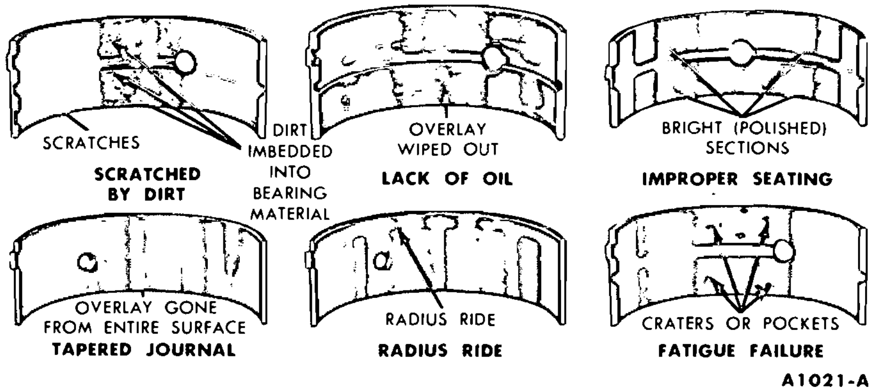


FIG. 47—Typical Bearing Failures

Make sure the threads in the cylinder head bolt holes are clean. Dirt in the threads may cause binding and result in a false torque reading. Use a tap to true-up threads and to remove any deposits.

Thoroughly clean the grooves in the crankshaft bearings and bearing retainers.

INSPECTION

After the block has been thoroughly cleaned, make a check for cracks. Minute cracks not visible to the naked eye may be detected by coating the suspected area with a mixture of 25% kerosene and 75% light motor oil. Wipe the part dry and immediately apply a coating of zinc oxide dissolved in wood alcohol. If cracks are present, the coating will become discolored at the defective area. Replace the block if it is cracked.

Check all machined gasket surfaces for burrs, nicks, scratches and scores. Remove minor imperfections with an oil stone. Check the flatness of the cylinder block gasket surface following the procedure and specifications recommended for the cylinder head. The cylinder block can be machined to bring the cylinder head gasket surface within the flatness specifications, **but not to exceed 0.010 inch stock removal.**

Replace all expansion-type plugs that show evidence of leakage.

Inspect the cylinder walls for scoring, roughness or other signs of wear. Check the cylinder bore for out-of-round and taper. Measure the bore with an accurate gauge following the instructions of the manufacturer. Measure the diameter of each cylinder bore at the top, middle and bottom with the gauge placed at right angles and parallel to the centerline of the engine (Fig. 48). Use

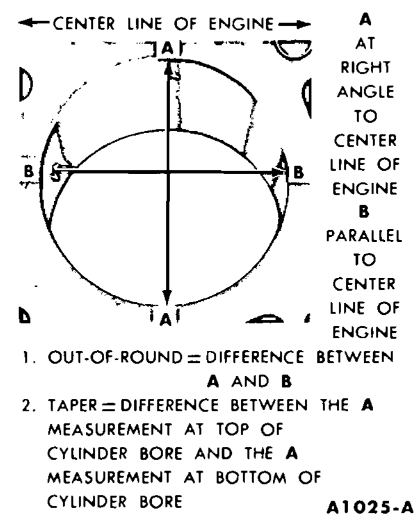


FIG. 48—Cylinder Bore Out-of-Round and Taper

only the measurements obtained at 90° to the engine centerline when calculating the piston to cylinder bore clearance.

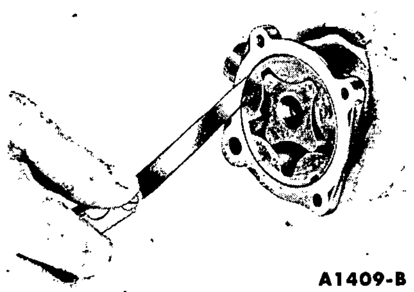
Refinish cylinders that are deeply scored and/or when out-of-round and/or taper exceed the wear limits.

If the cylinder walls have minor surface imperfections, but the out-of-round and taper are within limits, it may be possible to remove the imperfections by honing the cylinder walls and installing new service piston rings providing the piston clearance is within specified limits. Refer to Section 2, Cylinder Block, Refinishing Cylinder Walls.

OIL PAN

CLEANING

Scrape any dirt or metal particles from the inside of the pan. Scrape all old gasket material from the gasket surface. Wash the pan in a solvent and dry it thoroughly. Be sure all foreign particles are removed from below the baffle plate.



A1409-B

FIG. 49—Outer Race to Housing Clearance

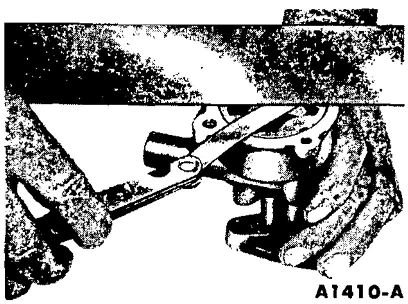


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FIG. 50—Rotor End Play

INSPECTION

Check the pan for cracks, holes, damaged drain plug threads, a loose baffle, and a nicked or warped gasket surface.

Repair any damage, or replace the pan if repairs can not be made.

OIL PUMP

CLEANING

Wash all parts in a solvent and dry them thoroughly with compressed air. Use a brush to clean the inside of the pump housing and the pressure relief valve chamber. Be sure all dirt and metal particles are removed.

INSPECTION

Refer to the specifications for clearances and wear limits.

Check the inside of the pump housing and the outer race and rotor for damage or excessive wear.

Check the mating surface of the pump cover for wear. If the cover mating surface is worn, scored or grooved, replace the cover.

Measure the outer race to housing clearance (Fig. 49) which should be to specifications.

With the rotor assembly installed in the housing so that the identification mark on the outer race is toward the bottom of the pump, place a straight edge over the rotor assembly and the housing. Measure the clearance (rotor end play) between the straight edge and the rotor and outer race (Fig. 50).

The outer race, shaft and rotor are replaceable only as an assembly.

Check the drive shaft to housing bearing clearance by measuring the OD of the shaft and the ID of the housing bearing.

Inspect the relief valve spring for a collapsed or worn condition. Check the relief valve spring tension. If the spring tension is not within specifications and/or the spring is defective, replace the spring.

Check the relief valve piston for scores and free operation in the bore.

POSITIVE CRANKCASE VENTILATION SYSTEM

Refer to the Maintenance or Owner's Manual for the correct mileage interval for maintenance.

CLEANING

Do not attempt to clean the crankcase ventilation regulator valve. It should be replaced at the specified mileage intervals.

The oil filler tube breather cap, located on the valve rocker arm cover should be cleaned at the specified interval. Remove the cap and wash it in a low-volatility, petroleum-base solvent. Probe the breather hole(s) to assure removal of any accumulated deposits. Shake the cap dry and install it. **Do not dry with compressed air as air pressure may damage the filter element.**

Clean the crankcase ventilation system connection on the carburetor spacer by probing the inlet nipple with a flexible wire or bottle brush.

Clean the rubber hoses with a low-volatility, petroleum-base solvent and dry with compressed air.

THERMACTOR EXHAUST EMISSION CONTROL SYSTEM

CLEANING AND INSPECTION

Backfire Suppressor Valve

Do not attempt to clean the backfire suppressor valve.

Air Pump Air Cleaner

When replacing the air cleaner element, clean the air cleaner body with a low-volatility, petroleum-base solvent, and wipe it dry with a clean, lint-free cloth.

Hoses, Lines And Air Manifolds

Normally, the air hoses, vacuum line and air manifolds should be cleaned only during major engine overhaul. If malfunctions or restrictions occur in the system, these components may require cleaning. Use a low-volatility, petroleum-base solvent and a suitable stiff bristle brush. Dry the cleaned parts, except the check valve, with compressed air. **Do not blow compressed air through the check valve in either direction. Shake it dry.**

Air Supply Pump

The air supply pump is protected against the entrance of foreign material by the air cleaner. Thus, it should require cleaning only when it is being overhauled.

Do not immerse the rotor and housing assembly in solvent as the bearing is permanently lubricated.

Clean the vane and bearing assemblies and rotor ring and rear bearing assembly in a clean petroleum-base solvent. **Do not use compressed air to dry the bearings. Shake the bearings to remove excess solvent, and let them drain dry.**

Inspect the bearings for discoloration, uneven rotation or looseness, and replace as required.

Wipe the rotor, housing and cover assembly with a cloth dampened in cleaning solvent. Wipe the parts dry with a clean cloth. Use compressed air to blow all carbon dust out of the rotor and housing assembly.

Clean the carbon shoes and shoe springs by wiping with a clean, dry cloth.

Inspect the vanes and carbon shoes for grooves or scores that would permit air leakage. Place each vane on the shaft (cover assembly) and check it for loose or worn bearings. Inspect the shaft for grooves and worn areas that might cause early wear on the vane and bearing assemblies.

Replace all worn, defective or broken parts.

ENGINE WILL NOT CRANK

The cause of this trouble is usually in the starting system (Group 14).

If the starting system is not at fault, check for a hydrostatic lock or a seized engine as follows:

Remove the spark plugs; then attempt to crank the engine with the starter. If the engine cranks, it indicates that water is leaking into the cylinders. Remove the cylinder head(s) and inspect the gasket(s) and/or head(s) for cracks. Examine the cylinder block for cracks.

ENGINE CRANKS NORMALLY, BUT WILL NOT START

Check the fuel supply. If there is sufficient fuel in the tank and the proper starting procedure is used, the cause of the trouble probably lies in either the ignition or the fuel system.

To determine which system is at fault, perform the following test:

Disconnect a spark plug wire. Check the spark intensity at the end of the wire by installing a terminal adapter in the end of the wire. Then hold the adapter approximately 3/16 inch from the exhaust manifold and crank the engine.

IF THERE IS NO SPARK OR A WEAK SPARK AT THE SPARK PLUGS

The cause of the trouble is in the ignition system.

Disconnect the brown lead (I terminal) and the red and blue lead (S terminal) at the starter relay.

Install an auxiliary starter switch between the battery and S terminals of the starter relay.

To determine if the cause of the trouble is in the primary or the secondary circuit, remove the coil high tension lead from the top of the distributor, **and hold it approximately 3/16 inch from the cylinder head.** With the ignition on, crank the engine and check for a spark.

If the spark at the coil high tension lead is good, the cause of the trouble is probably in the distributor cap, rotor or spark plug wires.

If there is no spark or a weak spark at the coil high tension lead, the cause of the trouble is probably in the primary circuit, coil to distributor high tension lead, or the coil.

IF THERE IS A GOOD SPARK AT THE SPARK PLUGS

Check the spark plugs. If the spark plugs are not at fault, check the following items:

MANUAL CHOKE

Check the choke linkage for binding or damage. Make certain the choke plate closes when the choke knob on the instrument panel is pulled out and that the plate opens when the knob is pushed in.

AUTOMATIC CHOKE

Check the position of the choke plate. If the engine is hot, the plate should be open. If the plate is not open, the engine will load up due to the excessively rich mixture and will not start. If the engine is cold, the plate should be closed. If the plate is not operating properly, check the following items:

The choke plate and linkage for binding.

The fast idle cam linkage for binding.

Thermostatic spring housing adjustment.

FUEL SUPPLY AT THE CARBURETOR

Work the throttle by hand several times. Each time the throttle is actuated, fuel should spurt from the accelerating pump discharge port (6-cylinder) or nozzles (V-8).

FIG. 51—Engine Diagnosis Guide

ENGINE CRANKS NORMALLY, BUT WILL NOT START (Continued)	If fuel is discharged by the accelerating pump, the engine is probably flooded, or there is water in the fuel system, or an engine mechanical item is at fault. If fuel is not discharged by the accelerating pump, disconnect the carburetor fuel inlet line at the carburetor. Use a suitable container to catch the fuel. Crank the engine to see if fuel is reaching the carburetor. If fuel is not reaching the carburetor, check: The fuel filter. The fuel pump flexible inlet line for a collapsed condition.	The fuel pump. The carburetor fuel inlet line for obstructions. The fuel tank line for obstructions. For fuel tank vent restriction. If fuel is reaching the carburetor, check: The fuel inlet system including the fuel inlet needle and seat assembly and the float assembly. **ENGINE** Mechanical failure in camshaft drive.
ENGINE STARTS, BUT FAILS TO KEEP RUNNING	**FUEL SYSTEM** Engine hot idle speed set too low. Idle fuel mixture needle(s) not properly adjusted. Engine fast idle speed set too low. The choke not operating properly. Float setting incorrect. Fuel inlet system not operating properly. Dirt or water in the fuel lines or in the fuel filter. Fuel pump defective. Carburetor icing.	Check for dirt in the carburetor not allowing fuel to enter or be discharged from the idle system. **IGNITION SYSTEM** Defective spark plugs. Leakage in the high tension wiring. Open circuit in primary resistance wire. Breaker points not properly adjusted.
ENGINE RUNS, BUT MISSES	Determine if the miss is steady or erratic and at what speed the miss occurs by operating the engine at various speeds under load. **MISSES STEADILY AT ALL SPEEDS** Isolate the miss by operating the engine with one cylinder not firing. This is done by operating the engine with the ignition wire removed from one spark plug at a time, until all cylinders have been checked. Ground the spark plug wire removed. If the engine speed changes when a particular cylinder is shorted out, that cylinder was delivering power before being shorted out. If no change in the engine operation is evident, the miss was caused by that cylinder not delivering power before being shorted out. In this case, check the: **IGNITION SYSTEM** If the miss is isolated in a particular cylinder, perform a spark test on the ignition lead of that cylinder. If a good spark does not occur, the trouble is in the secondary circuit of the system. Check the spark plug wire and the distributor cap. If a good spark occurs, check the spark plug. If the spark plug is not at fault, a mechanical component of the engine is probably at fault.	**ENGINE** Intake manifold gasket leak. Perform a manifold vacuum or compression test to determine which mechanical component of the engine is at fault. **MISSES ERRATICALLY AT ALL SPEEDS** **EXHAUST SYSTEM** Exhaust system restricted. **IGNITION SYSTEM** Breaker points not properly adjusted. Defective breaker points, condenser, secondary wiring, coil or spark plugs. High tension leakage across the coil, rotor or distributor cap. Defective ignition switch. Excessive distributor cam runout.

FIG. 51—(Continued)—Engine Diagnosis Guide

ENGINE RUNS, BUT MISSES (Continued)	**FUEL SYSTEM** Restricted fuel filter. Fuel inlet system not operating properly. Dirt or water in the fuel lines or carburetor. Float setting incorrect. Loose booster venturi (V-8). **COOLING SYSTEM** Check the cooling system for internal leakage and/or for a condition that prevents the engine from reaching normal operating temperature. **ENGINE** Perform a manifold vacuum or compression test to determine which mechanical component of the engine is at fault. Anti-backfire valve stuck open (if equipped with Thermactor exhaust emission control). **MISSES AT IDLE ONLY** **FUEL SYSTEM** Idle fuel mixture needle(s) not properly adjusted. Restriction in idle fuel system. **IGNITION SYSTEM** Excessive play in the distributor shaft. Worn distributor cam. Defective coil, rotor, condenser, breaker points, ignition wiring or spark plugs. **ENGINE** Valve lash (engines with mechanical valve lifters) or valve clearance (engines with hydraulic valve lifters) set too tight. Worn camshaft lobe(s). Perform a manifold vacuum or compression test to determine which mechanical component of the engine is at fault. **MISSES AT HIGH SPEED ONLY** **FUEL SYSTEM** Restricted fuel filter. Power valve or passages clogged or damaged. Low or erratic fuel pump pressure. Fuel inlet system not operating properly. Restricted main fuel system. **IGNITION SYSTEM** Defective spark plugs. High secondary wiring resistance. **COOLING SYSTEM** Engine overheating. **ENGINE** Perform a manifold vacuum or compression test to determine which mechanical component of the engine is at fault.
ROUGH ENGINE IDLE	**FUEL SYSTEM** Engine idle speed set too low. Idle fuel mixture needle(s) not properly adjusted. Float setting incorrect. Air leaks between the carburetor, spacer and the manifold and/or fittings. Intake manifold gasket leak (V-8). Fuel leakage at the carburetor fuel bowl. Power valve leaking fuel (V-8). Idle fuel system air bleeds or fuel passages restricted. Secondary throttle plate(s) not closing (4-barrel carburetor). Improper secondary throttle plate stop adjustment (4-barrel carburetor). Leaking fuel pump, lines or fittings. **IGNITION SYSTEM** Improperly adjusted or defective breaker points. Fouled or improperly adjusted spark plugs. Incorrect ignition timing. High secondary wiring resistance. **ENGINE** Leaking vacuum fittings. Loose engine mounting bolts or worn engine support insulator. Cylinder head bolts not properly torqued. Crankcase ventilation regulator valve defective or a restricted vent tube. Valve clearance set too tight. Worn camshaft lobes. Perform a manifold vacuum or compression test to determine which mechanical component is at fault.

FIG. 51—(Continued)—Engine Diagnosis Guide

POOR ACCELERATION	**IGNITION SYSTEM** Incorrect ignition timing. Fouled or improperly adjusted spark plugs. Improperly adjusted or defective breaker points. Distributor not advancing properly. Loose or defective spark control valve (6-cylinder). **FUEL SYSTEM** Throttle linkage not properly adjusted. Accelerating pump stroke not properly adjusted. Accelerating pump malfunction. Float setting incorrect. Leaky power valve, gaskets or accelerating pump diaphragm. Power valve piston stuck in the up position (6-cylinder).	Distributor vacuum passages in the carburetor blocked. Restricted fuel filter. Defective fuel pump. **BRAKES** Improper adjustment—too tight. **TRANSMISSION** Clutch slippage (manual-shift transmissions). Improper band adjustment (automatic transmissions). Converter One-Way Clutch (automatic transmissions). **ENGINE** Perform a manifold vacuum or compression test to determine which mechanical component of the engine is at fault.
ENGINE DOES NOT DEVELOP FULL POWER, OR HAS POOR HIGH SPEED PERFORMANCE	**FUEL SYSTEM** Throttle linkage improperly adjusted. Restricted air cleaner. Restricted fuel filter. Clogged or undersize main or secondary jets and/or low float setting. Power valve or passages clogged or damaged. Fuel pump pressure incorrect. Distributor vacuum passage in the carburetor blocked. Power valve piston stuck in the up position (6-cylinder). Improper carburetor float setting. Secondary throttle plates not opening (V-8). Automatic choke malfunctioning or improperly adjusted. **IGNITION SYSTEM** Ignition timing not properly adjusted. Improperly adjusted or defective breaker points. Distributor not advancing properly. Excessive play in the distributor shaft. Distributor cam worn. Fouled or improperly adjusted spark plugs, or spark plugs of incorrect heat range.	Defective coil, condenser or rotor. **EXHAUST SYSTEM** Restriction in system. **COOLING SYSTEM** Thermostat inoperative or of incorrect heat range. Thermostat installed incorrectly. Check the cooling system for internal leakage and/or for a condition that prevents the engine from reaching normal operating temperature. **ENGINE** Perform a manifold vacuum or engine compression test to determine which mechanical component of the engine is at fault. One or more camshaft lobes worn beyond wear limit. Worn valve guides. Positive crankcase ventilation system not operating properly. **TRANSMISSION** Improper band adjustment (automatic transmissions).
EXCESSIVE FUEL CONSUMPTION	Determine the actual fuel consumption with test equipment installed in the vehicle. If the test indicates that the fuel consumption is not excessive, demonstrate to the owner how improper driving habits will affect fuel consumption.	If the test indicates that the fuel consumption is excessive, make a preliminary check of the following items before proceeding to the fuel and ignition systems.

FIG. 51—(Continued)—Engine Diagnosis Guide

EXCESSIVE FUEL CONSUMPTION (Continued)	**PRELIMINARY CHECKS** **CHASSIS ITEMS** Check: Tires for proper pressure. Front wheel alignment. Brake adjustment. **EXHAUST SYSTEM** System restricted. **ODOMETER** Check calibration. **IGNITION SYSTEM** Check: Distributor breaker points. Ignition timing. **ENGINE** Crankcase ventilation regulator valve defective or restricted tubes (Positive Crankcase Ventilation System). **FINAL CHECKS** **FUEL SYSTEM** Check: Float setting or fuel level. Power valve operation. Choke adjustment. Automatic choke for proper operation. Air cleaner for restrictions. Engine idle speed. Idle fuel mixture needle(s) for proper adjustment. Accelerating pump stroke adjustment. Air bleeds for obstructions. Fast idle speed screw for proper adjustment. Fuel pump pressure excessive. Jets for wear and/or damage. Anti-stall dashpot for proper adjustment. Accelerating pump discharge port (6-cylinder) or nozzles (V-8) for siphoning. **IGNITION SYSTEM** Check: Ignition timing. Spark plug condition and adjustment. Distributor spark advance operation. Spark control valve for proper seating (6-cylinder). **ENGINE** Perform a manifold vacuum or engine compression test to determine which mechanical component of the engine is at fault. Check valve clearance (hydraulic lifters) or valve lash (mechanical tappets). **COOLING SYSTEM** Check thermostat operation and heat range. **TRANSMISSION** Check band adjustment (automatic transmissions).
ENGINE OVERHEATS	**TEMPERATURE SENDING UNIT AND GAUGE** Unit or gauge defective (not indicating correct temperatures) or constant voltage regulator defective. **ENGINE** Cylinder head gasket leaks. Incorrect valve lash (engine with mechanical valve lifters) or valve clearance (engines with hydraulic valve lifters). Low oil level or incorrect viscosity oil used. **COOLING SYSTEM** Insufficient coolant. Cooling system leaks. Drive belt tension incorrect. Radiator fins obstructed. Thermostat defective. Thermostat improperly installed. Cooling system passages blocked. Water pump inoperative. Faulty fan drive. **IGNITION SYSTEM** Incorrect ignition timing. Incorrect distributor advance. **EXHAUST SYSTEM** Restrictions in system. **BRAKES** Improper adjustment—too tight.

FIG. 51—(Continued)—Engine Diagnosis Guide

LOSS OF COOLANT	**COOLING SYSTEM** Loose or damaged hose connections. Radiator cap defective. Overheating. Leaking radiator or water pump. **ENGINE** Cylinder head gasket defective.	Intake manifold to cylinder head gasket defective (V-8). Cylinder head or intake manifold bolts (V-8) not properly torqued. Cylinder block core plugs leaking. Temperature sending unit leaking. Cracked cylinder head or block, or warped cylinder head or block gasket surface.
ENGINE FAILS TO REACH NORMAL OPERATING TEMPERATURE	**TEMPERATURE SENDING UNIT AND GAUGE** Unit or gauge defective (not indicating correct temperature) or constant voltage regulator defective.	**COOLING SYSTEM** Thermostat inoperative or of incorrect heat range.
NOISY HYDRAULIC VALVE LIFTER	A noisy hydraulic valve lifter can be located by operating the engine at idle speed and placing a finger on the face of the valve spring retainer. If the lifter is not functioning properly, a shock will be felt when the valve seats. Another method of identifying a noisy lifter is by the use of a piece of hose. With the engine operating at idle speed, place one end of the hose near the end of the valve stem and the other end to the ear and listen for a metallic noise. Repeat this procedure on each intake and exhaust valve until the noisy lifter(s) has been located. The most common causes of hydraulic valve lifter troubles are dirt, gum, varnish, carbon deposits and air bubbles. Dirt in the lifter assembly can prevent the disc valve from seating, or it may become lodged between the plunger and body surfaces. In either case, the lifter becomes inoperative due to failure to "pump-up," or because the internal parts are no longer free to function properly. When dirt is found to be responsible for lifter malfunction, remove the lifter assembly and thoroughly clean it. Recommended engine oil and filter change intervals should be followed to minimize lifter problems caused by dirt. Deposits of gum and varnish cause similar conditions to exist which may result in lifter malfunction. If these conditions are found to be present, the lifter should be disassembled and cleaned in solvent to remove all traces of deposits. Air bubbles in the lubricating oil,	caused by an excessively high or low oil level, may likewise cause lifter malfunction. A damaged oil pick-up tube may allow air to be drawn into the lubricating system. Check for engine oil aeration as follows: Check the engine oil level to be sure it is within specification and correct as required. **Be sure the correct engine oil dipstick is being used.** Operate the engine at approximately 1200 rpm until normal operating temperature is reached. Stop the engine and remove the oil pressure sending unit. Install a fitting in this opening with a petcock-type valve that will permit attachment of a 1/4 to 3/8-inch-diameter hose of sufficient length to direct the oil discharge into the oil filler pipe. Close the valve. Start the engine and operate it at approximately 500 rpm for a minimum of 5 minutes; then, open the valve slightly to permit a steady discharge of oil. Check the oil flow for air bubbles. Increase the engine speed to approximately 1000 rpm and check for air bubbles in the oil. **To facilitate checking for air bubbles, direct the oil flow over white paper or through a piece of transparent tube. The engine should not be operated at excessive speeds or for extended periods with the oil bleed attached.** If oil aeration is evident, remove the oil pan for further test and/or inspection of the oil pump intake system. Perform corrective action as required to remove air from the lubricating oil.

FIG. 51—(Continued)—Engine Diagnosis Guide

EXCESSIVE BACKFIRE IN EXHAUST SYSTEM	Backfire suppressor valve vacuum line collapsed, plugged, disconnected or leaking. Defective or malfunctioning backfire suppressor valve resulting in insufficient air delivery to the intake manifold or air delivery not timed to engine requirement.
EXCESSIVE HESITATION ON ACCELERATION AFTER SUDDEN THROTTLE PLATE CLOSURE (ABOVE 20 MPH)	Intake vacuum leak at backfire suppressor valve vacuum line or air outlet line (to intake manifold). Defective or malfunctioning backfire suppressor valve.
AIR SUPPLY HOSE (S) BAKED OR BURNED	Defective check valve on air supply manifold(s).
NOISY AIR PUMP DRIVE BELT	Drive belt improperly adjusted. Seized or failing air pump. Misaligned or defective pulleys.
ROUGH ENGINE IDLE	Improper carburetor adjustment — idle speed, idle fuel mixture, automatic choke, etc., (Group 10). Improper initial ignition timing. Intake vacuum leak at the backfire suppressor valve vacuum line or air inlet hose. Backfire suppressor valve defective or stuck open.
ENGINE SURGES AT ALL SPEEDS	Backfire suppressor valve defective or stuck open. Improper carburetor adjustment — idle speed, idle fuel mixture, automatic choke, etc., (Group 10).

FIG. 52—Thermactor Diagnosis Guide

PART 8-2—170 and 200 Six

1 DESCRIPTION AND OPERATION

The 170 and 200 Six engines (Figs. 1, 2, 3, and 4) have compression ratios of 9.1 and 9.2 respectively. The 170 Six engine has a piston displacement of 170 cubic inches and the patent plate identification symbol is U. The 200 Six engine has a piston displacement of 200 cubic inches and the patent plate symbol is T.

MANIFOLDS

Exhaust gases provide the heat necessary to assist in vaporizing the incoming fuel mixture.

To prevent carburetor icing at the throttle plate, a coolant-heated spacer is installed between the carburetor and the intake manifold (Fig. 5). On IMCO engines, the coolant-heated spacer is not used. If equipped with a coolant-heated spacer, the coolant flows from the front of the engine through the spacer inlet hose into the carburetor coolant spacer. The coolant circulates through the spacer and flows into the heater inlet hose and into the heater. On vehicles that do not have a heater the coolant flows through the spacer and flows into the return hose and into the water pump.

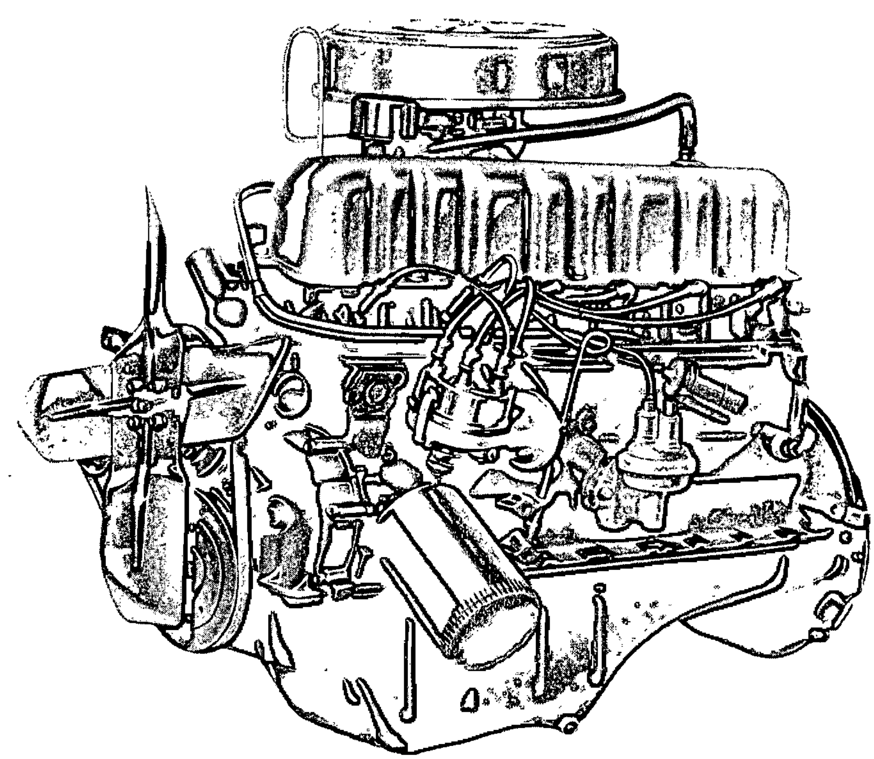

FIG. 1—Typical 3/4 Left Front View

CYLINDER HEAD

The cylinder head carries the valves, valve rocker arm shaft assembly, integrally cast intake manifold, the coolant outlet and thermostat. Valve guides are integral with the head. The valves are arranged from front to rear E-I-I-E-I-E-E-I-E-I-I-E.

CYLINDER BLOCK

The cylinders are numbered from 1 to 6 starting at the front of the engine. The firing order is 1-5-3-6-2-4.

The distributor, located on the left front of the engine, drives the oil pump through an intermediate drive shaft.

The crankshaft used on the 170 engine is supported by four main bearings. Crankshaft end thrust is controlled by the flanges of the No. 3 main bearing.

The crankshaft used on the 200 engine is supported by seven main bearings. Crankshaft end thrust is controlled by the flanges of the No. 5 main bearing.

The pistons have two compression rings and one oil control ring. The top compression ring is molybdenum coated and the lower compression ring is phosphate-coated. The oil control ring assembly consists of a serrated spring and two chrome-plated steel rails.

VALVE TRAIN

The 170 and 200 Six engines utilize hydraulic valve lifters to provide zero lash. The operation and parts identification of the hydraulic valve lifters are shown in Fig. 6. When the valve is closed, the lifter assembly is on the base circle of the camshaft lobe and the valve push rod is in its lowest position. With the lifter assembly in this position, the plunger spring expands, forcing the plunger upward. This action is transmitted to the valve rocker arm via the valve push rod until there is solid contact between the valve and the valve end of valve rocker arm (zero valve lash).

As the lifter plunger moves upward, the volume of the compression chamber is increased, resulting in reduced oil pressure in the compression chamber. Therefore, to equalize the resulting pressure differential between the supply chamber and the compression chamber, the disc valve moves off its seat and permits oil to flow from the supply chamber to the compression chamber. When the compression chamber becomes filled

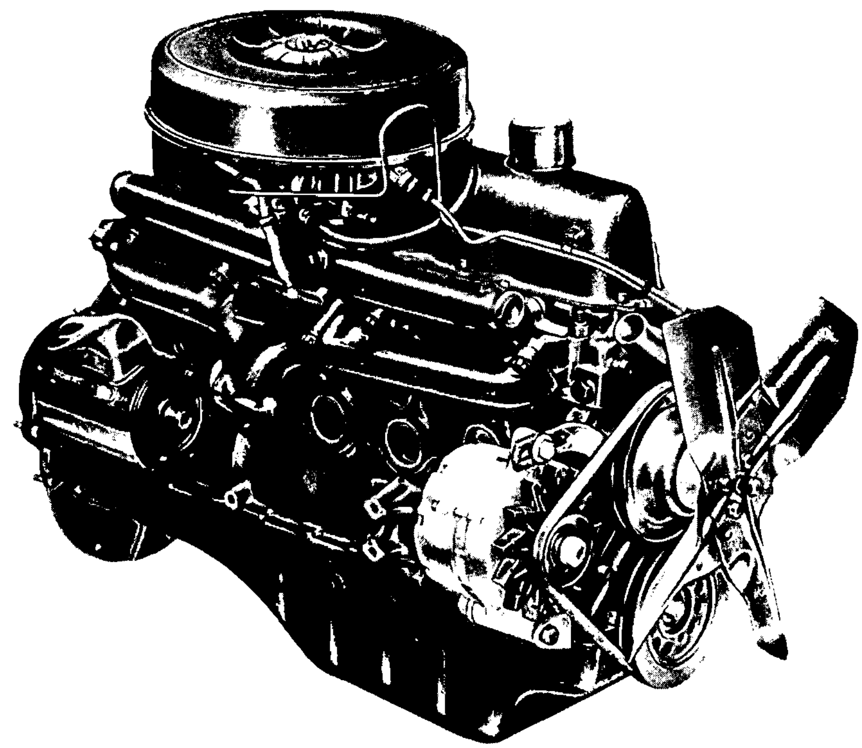

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FIG. 2—3/4 Right Front View

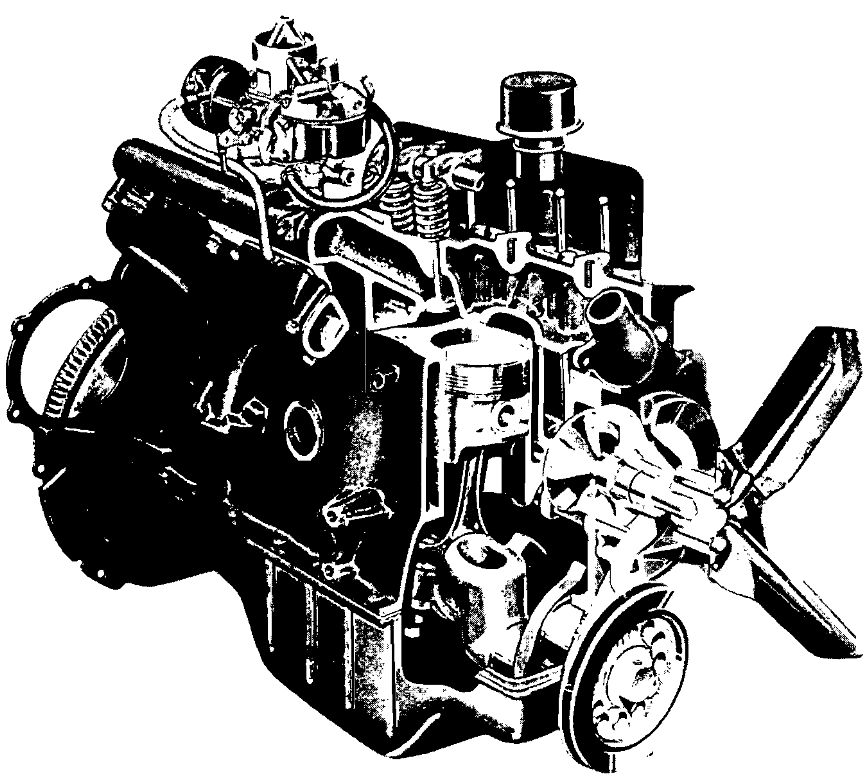

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FIG. 3—3/4 Sectional View—170 Six Engine

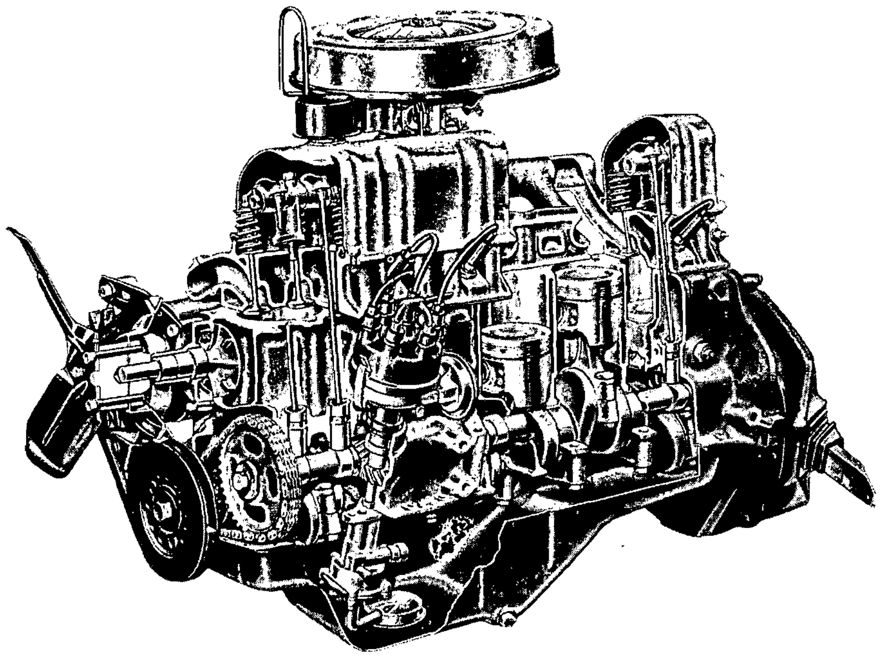


FIG. 4—3/4 Sectional View—200 Six Engine

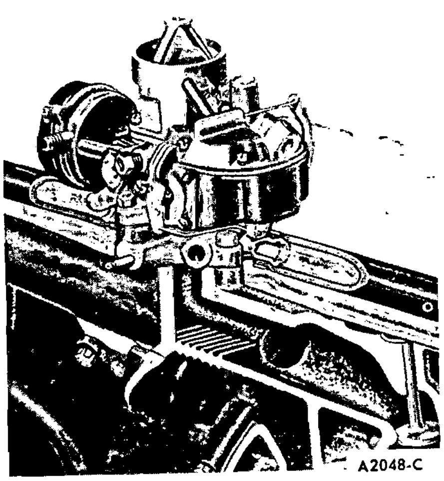


FIG. 5—Typical Coolant-Heated Carburetor Spacer

with oil, the pressures in the two chambers are equalized. The oil flow ceases and the disc valve spring seats the disc valve and closes the disc valve port.

As the camshaft rotates, the lifter assembly is raised by the camshaft lobe. This increases the push rod force against the lifter plunger and hydraulic pressure immediately builds up in the compression chamber until it acts as a solid member of the valve operating mechanism. The lifter then becomes a hydraulic ram which forces the valve in the cylinder head to open. During this period, a slight leakage of oil past the plunger occurs (calibrated leak down rate).

As the high point of the camshaft lobe rotates and passes by the foot of the valve lifter, the valve in the cylinder head seats and the valve lifter assembly is forced downward. Reduced force on the lifter plunger at this time relieves the pressure on the lifter plunger and it is free to be moved upward by the plunger spring. This action allows oil to flow once again through the oil holes in the lifter body and plunger.

The operating cycle is completed for each revolution of the camshaft. Zero clearance (lash) in the valve train mechanism is maintained at all times by the hydraulic force and expansion of the plunger spring between the lifter body and plunger.

LUBRICATION SYSTEM

Oil from the oil pan sump is forced through the pressure-type lubrication system (Fig. 7) by a rotor pump. A spring-loaded relief valve in the pump limits the maximum pressure of the system. Oil relieved by the valve is directed back to the intake side of the pump.

All the oil discharged by the pump passes through a full flow-type filter before it enters the engine. The filter has an integral by-pass valve and mounting gasket. The by-pass valve permits oil to by-pass the filter if it becomes clogged, thereby maintaining an emergency supply of oil to the engine at all times. An anti-drain back diaphragm prevents a reverse flow of oil when the engine is stopped.

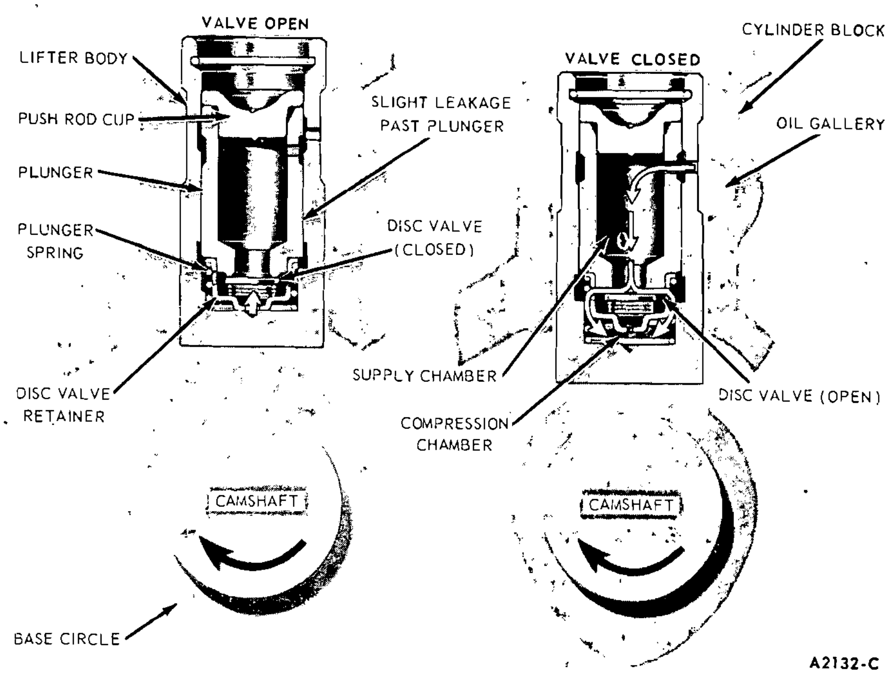


FIG. 6—Hydraulic Valve Lifter Operation

From the filter, the oil flows into the main oil gallery. The oil gallery supplies oil to all the camshaft and main bearings through a drilled passage in each main bearing web.

The timing chain and sprockets are splash-lubricated from the oil pan.

Oil slingers prevent leakage by directing oil away from the crankshaft front and rear oil seals.

Cylinder walls, pistons and piston pins are lubricated through a drilled hole in each connecting rod which indexes with a drilled hole in the connecting rod journal of the crankshaft.

Oil from the main gallery feeds pressure oil to the hydraulic valve lifters and lubricates the lifter bores in the cylinder block. A reservoir at each valve lifter bore boss traps oil so that oil is available for valve lifter lubrication as soon as the engine starts.

Oil under reduced pressure is fed to the valve rocker arm shaft assembly through a drilled passage in the cylinder block at the No. 4 camshaft bearing. The oil is metered by a groove in the camshaft journal. The passage in the block indexes with a hole in the cylinder head. The oil passage in the cylinder head is drilled from the cylinder head bolt bore to the No. 6 valve rocker arm shaft support. The rocker arm shaft supports have a square cored bolt mounting hole for more positive lubrication of the rocker arms, shafts and valves. The oil flows through the valve rocker arm shaft through drilled holes in each rocker arm to lubricate the valve and the push rod end of the rocker arm. The excess oil spirals down the rotating push rod and assists in lubricating the tappet and push rod seat. An oil outlet in the No. 1 rocker arm shaft support, exhausts excess oil from the valve rocker arm shaft. The oil from each rocker arm drains into the push rod chamber through the push rod bore holes in the cylinder head.

The oil in the push rod chamber drains back into the oil pan through cored openings in the block.

COOLING SYSTEM

The coolant is drawn from the bottom of the radiator by the water pump which delivers the coolant to the cylinder block (Fig. 8).

As the coolant enters the block, it travels through cored passages to cool the entire length of each cylinder wall. Upon reaching the rear of the cylinder block, the coolant is

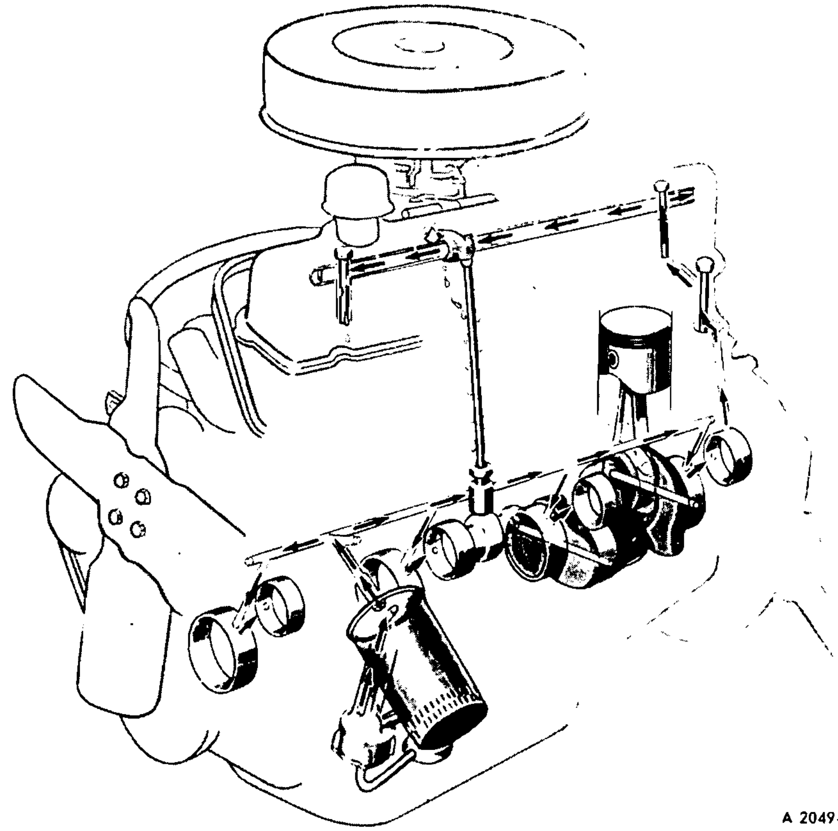


FIG. 7—Typical Lubrication System

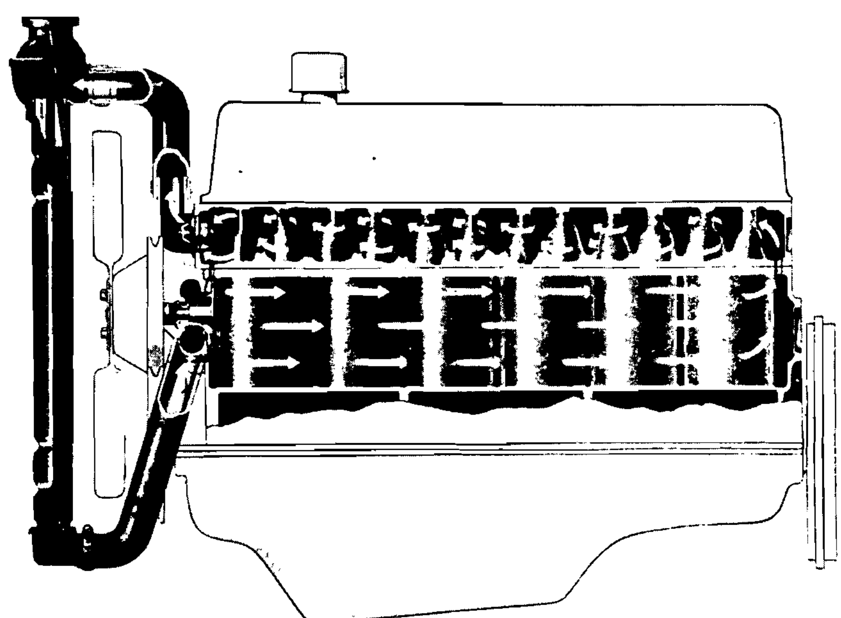


FIG. 8—Cooling System

directed upward into the cylinder head where it cools the combustion chambers, valves, and valve seats on its return to the front of the engine.

At this point, the coolant flows into the coolant outlet connection, past the thermostat if it is open, and into the top of the radiator. If the thermostat is closed, a small portion of the coolant is returned to the water pump for recirculation. The entire system is pressurized to 13-15 psi.

POSITIVE CRANKCASE VENTILATION

The engines are equipped with either an open positive crankcase ventilation system or a closed positive crankcase ventilation system. In either system the crankcase vapors are directed to the intake manifold.

OPEN VENTILATION SYSTEM

The air flow in the positive crankcase ventilation system is shown in Fig. 9.

Ventilating air enters the engine through the oil filler cap located on the front of the valve rocker arm cover. The filler cap contains a filtering element which filters the incoming air.

From the oil filler cap, the air flows into the front section of the valve rocker arm shaft chamber. The ventilating air moves down past the push rods and into the crankcase. Air is diverted from the front section of the crankcase through holes in the front of the cylinder block wall to ventilate the timing chain chamber.

The rotating action of the crankshaft causes the air to flow towards the rear of the crankcase and up into the rear section of the valve rocker arm cover. The air then enters a spring-loaded regulator valve that regulates the amount of air flow to meet changing operating conditions. The air is then directed to the intake manifold through the crankcase vent hose and the spacer fitting.

During idle, intake manifold vacuum is high. The high vacuum overcomes the tension of the spring pressure and moves the valve to a low flow position (Fig. 10). With the valve in this position, all the ventilating air passes through the restricted passage in the valve. With the valve in this position, there is minimum ventilation. As engine speed increases and manifold vacuum decreases, the spring forces the valve out of the passage and to the full open position (Fig. 10). This increases the flow of ventilating air.

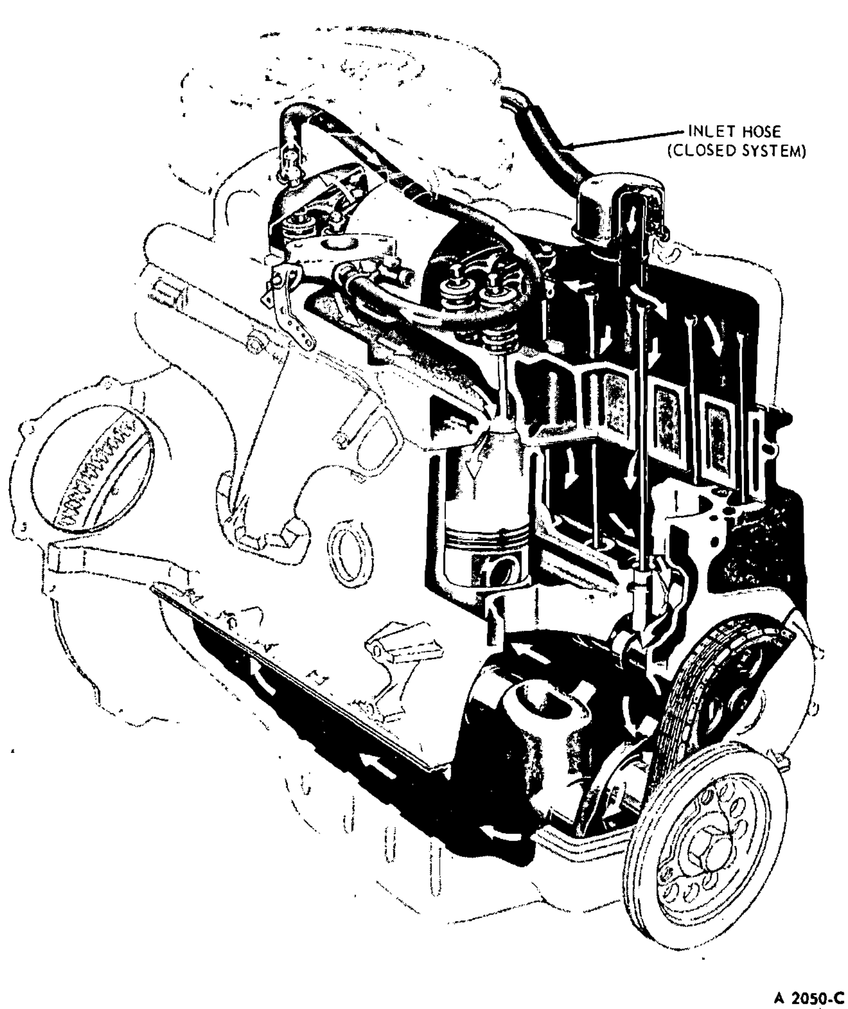


FIG. 9—Typical Positive Crankcase Ventilation System

CLOSED VENTILATION SYSTEM

The closed ventilation system is the same as the open ventilation system except for the following:

The ventilating air is picked up at the air cleaner and transferred through a tube to the oil filler cap.

The oil filler cap is otherwise closed to the atmosphere.

EXHAUST EMISSION CONTROL SYSTEMS

The 1967 engines incorporate two different types of exhaust emission control systems.

Both the IMCO and Thermactor systems are designed to reduce the hydrocarbon and carbon monoxide content of gasoline engine exhaust gases. By controlling the amount of contaminants emitted through the exhaust system to an acceptable minimum, air polution is reduced. The IMCO engines are identified by the

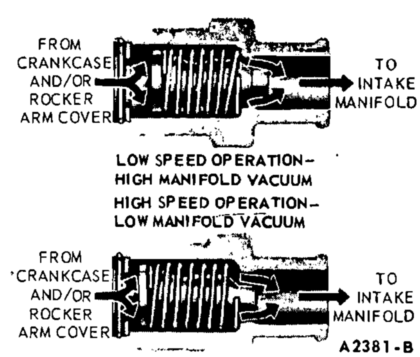


FIG. 10—Positive Crankcase Ventilation Regulator Valve Operation

Carter 1-V, Model YF, carburetor and they do not use a coolant-heated carburetor spacer. Thermactor engines are identified by the air pump, air cleaner and backfire suppressor valve.

IMCO

The IMCO exhaust emission con-

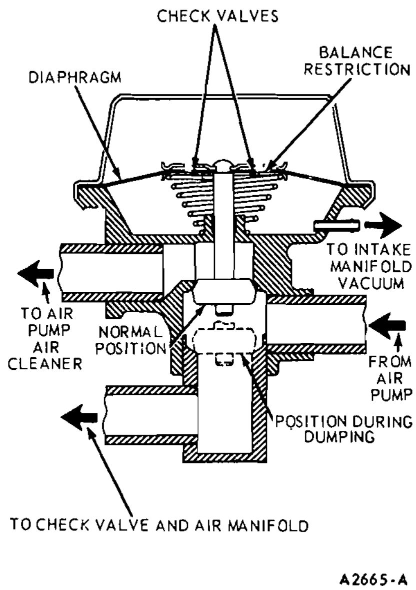


FIG. 11—Air Bypass-Type Valve

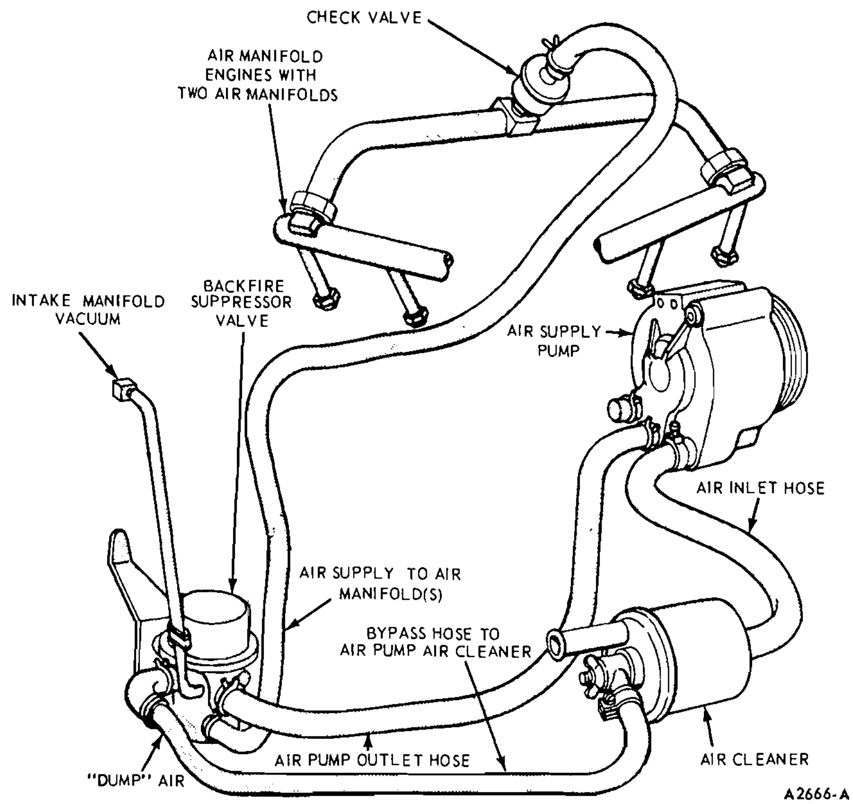


FIG. 12—Schematic—Thermactor System

trol system controls engine combustion at a level to reduce contaminants normally emitted through the exhaust system. This is achieved by using a specially-calibrated carburetor and distributor in conjunction with revised valve timing events.

THERMACTOR

Control of exhaust-emitted gases by the Thermactor system is achieved by burning the hydrocarbon and carbon monoxide concentrations in the exhaust ports of the cylinder head. To accomplish this burning of the contaminants, air under pressure is injected into the exhaust ports near each exhaust valve. The oxygen in the air plus the heat of the exhaust gases in each exhaust outlet port induces combustion during the exhaust stroke of the piston. The burned gases then flow out the exhaust manifold into the exhaust system.

The Thermactor system consists of: an air supply pump; an air pump air cleaner; a backfire suppressor valve; a check valve; a check valve tube assembly; a front and rear air manifold for the cylinder head; an air delivery tube for the exhaust port of each engine cylinder; and the connecting air supply hoses and vacuum sensing line.

A sectional view of the air bypass-type backfire suppressor valve is shown in Fig. 11.

Fig. 12 is a schematic diagram of the thermactor exhaust emission control system. Installation drawings are shown in Fig. 13.

Air under pressure from the pump flows through a hose(s) to the air manifold(s) that distributes the air to the air delivery tube in each exhaust port. A check valve is incorporated in the inlet air side of the air manifold preventing a backflow of exhaust gases into the air pump during operating periods when the exhaust back pressure exceeds the air pump delivery pressure.

All the air from the air supply pump passes through the backfire suppressor valve. Normally, the air is directed to the check valve and into the air manifolds. During engine deceleration periods air delivery to the air manifolds is momentarily interrupted and the air is diverted to the air pump air cleaner.

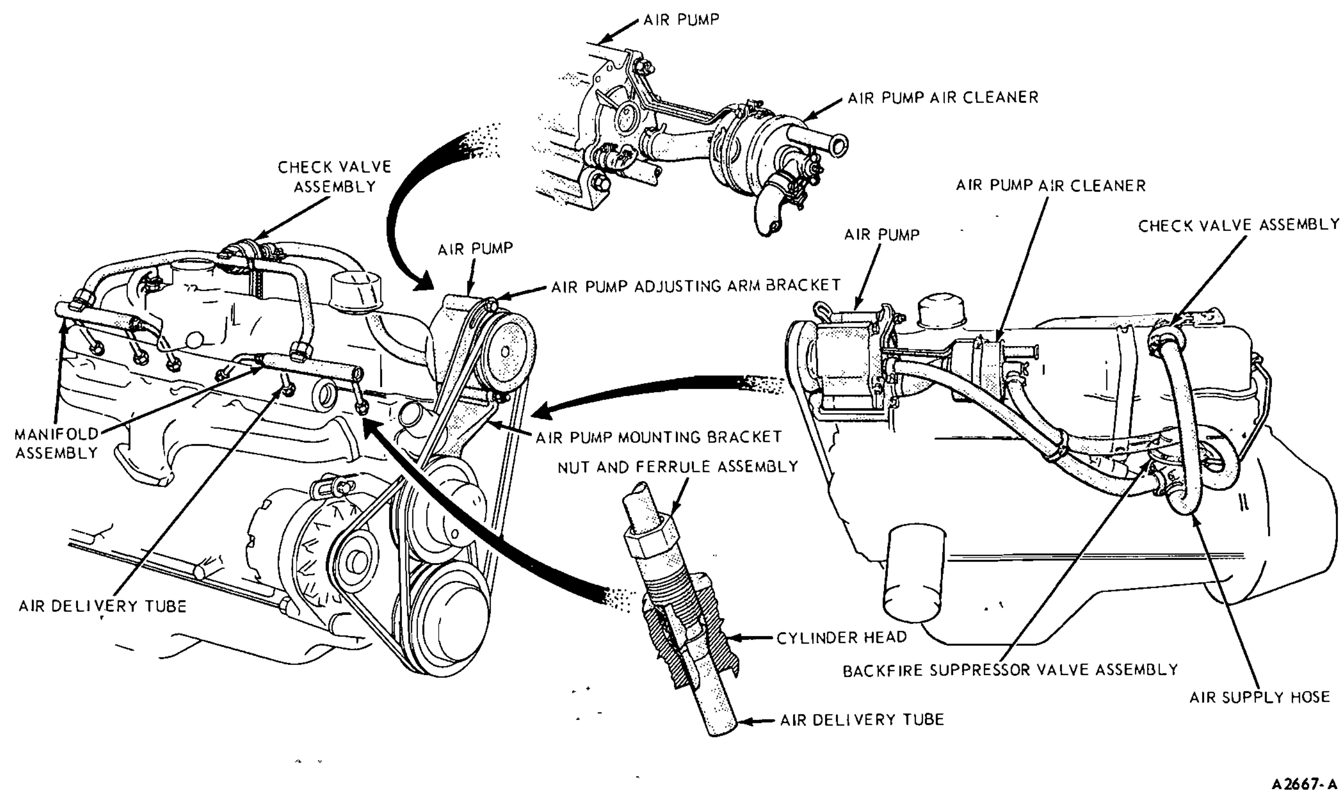


FIG. 13—170 and 200 Six Engine—Typical Thermactor Exhaust Emission System

2 IN-VEHICLE ADJUSTMENTS AND REPAIRS

When installing nuts or bolts that must be torqued (refer to Part 8-5 for torque specifications), oil the threads with light-weight engine oil. **Do not oil threads that require oil-resistant or water-resistant sealer.**

ENGINE FRONT SUPPORT

The procedures given apply to either a right or left installation. The engine front supports are located on each side of the cylinder block (Figs. 14 and 15).

MUSTANG

Removal

1. Remove the insulator to support bracket nuts and washers from both insulators (Fig. 14).
2. Raise the engine with a jack and wood block placed under the oil pan.
3. Remove the insulator to engine bolts and washers and remove the insulator.

Installation

1. Position the insulator assembly on the engine and install the insulator to engine bolts and washers finger-tight.
2. Lower the engine carefully to make sure the insulator stud engages the hole in the support bracket.
3. Install the insulator to support bracket washer and nut on both engines front mounts. Tighten the insulator bolts and nuts to specifications.

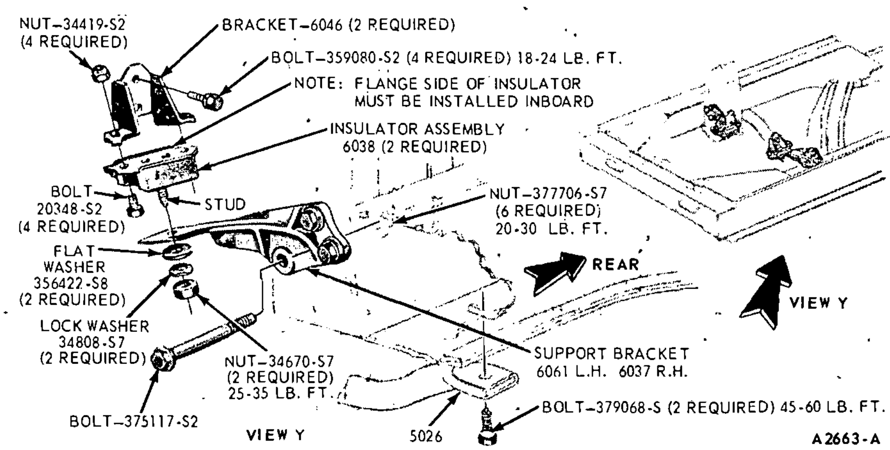


FIG. 14—Mustang Engine Front Supports

FAIRLANE, MERCURY INTERMEDIATE AND FALCON

Removal

1. Remove the insulator to support bracket retaining nut.
2. Using a wood block placed under the oil pan raise the engine only enough to clear the insulator bolt at the frame bracket.

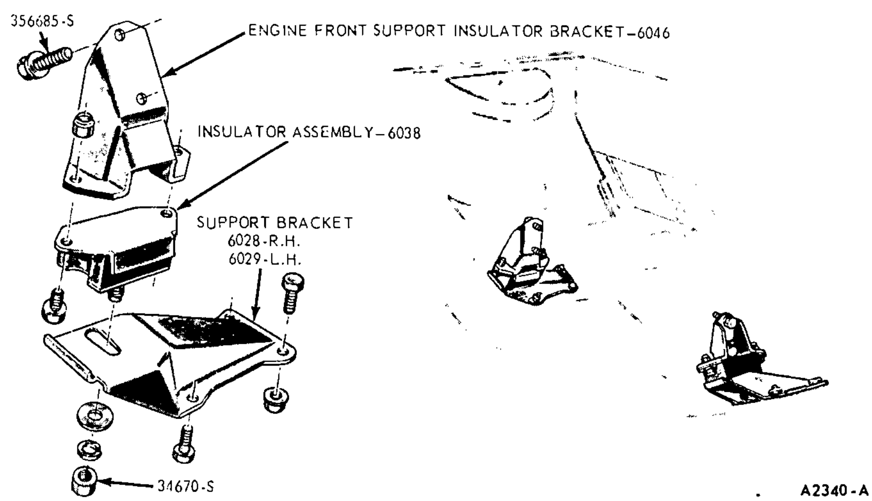


FIG. 15—Fairlane, Mercury Intermediate and Falcon Engine Front Supports

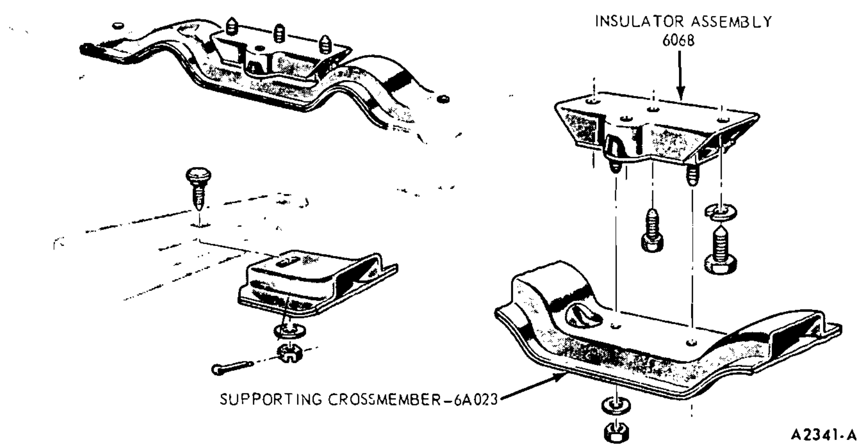


FIG. 16—Fairlane, Mercury Intermediate and Falcon Engine Rear Support

3. Remove the retaining screws and nuts from the insulator to engine front support insulator bracket, and remove the insulator.

Installation

1. Position the insulator to the engine front support insulator bracket and install the retaining screws and nuts. Torque to specifications.

2. Carefully lower the engine guiding the insulator bolt into the frame bracket.

3. Install the insulator to frame bracket retaining nut, and torque to specifications.

ENGINE REAR SUPPORT

The rear support is located at the transmission extension housing (Fig. 16).

FAIRLANE, MERCURY INTERMEDIATE AND FALCON

Removal

1. Support the transmission with a floor jack to relieve weight from the supporting crossmember.
2. Remove the retaining nuts, washers, and cotter keys from the supporting crossmember, and remove the supporting crossmember.
3. Remove the screws and washers which retain the engine rear support insulator assembly beneath the transmission.
4. Remove the insulator assembly.

Installation

1. Position the engine rear support insulator assembly in place beneath the transmission, and install the re-

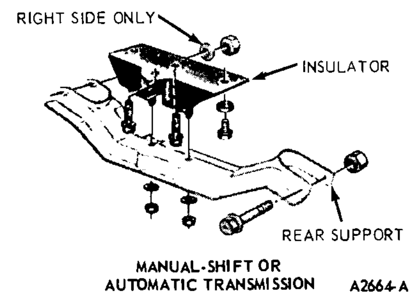


FIG. 17—Mustang and Cougar Engine Rear Support

taining screws. Torque them to specifications.
2. Position the supporting crossmember and install the retaining washers and nuts. Torque them to specifications.
3. Install the cotter keys. If necessary, continue tightening the two outer nuts as required to align the castellations.

MUSTANG

Removal

1. Remove the insulator to rear support nuts and washers (Fig. 17).
2. Raise and support the transmission with a transmission jack.
3. Loosen one of the rear support to crossmember bolts.
4. Remove the other rear support to crossmember bolt, washer (right side only) and nut, and swing the rear support down and out of the way.
5. Remove the insulator to transmission bolts and washers and remove the insulator.

Installation

1. Position the insulator against the transmission and install the insulator to transmission bolts and washers (Fig. 17). Torque the bolts to specifications.
2. Swing the rear support up into position and install the rear support to crossmember bolt, washer (right side only) and nut. Torque both rear support to crossmember nuts to specifications.
3. Lower the transmission and install the insulator to rear support nuts and washers. Torque the nuts to specifications.

THERMACTOR AIR PUMP DRIVE BELT ADJUSTMENT

The air supply pump drive belt should be properly adjusted at all times. A loose drive belt causes im-

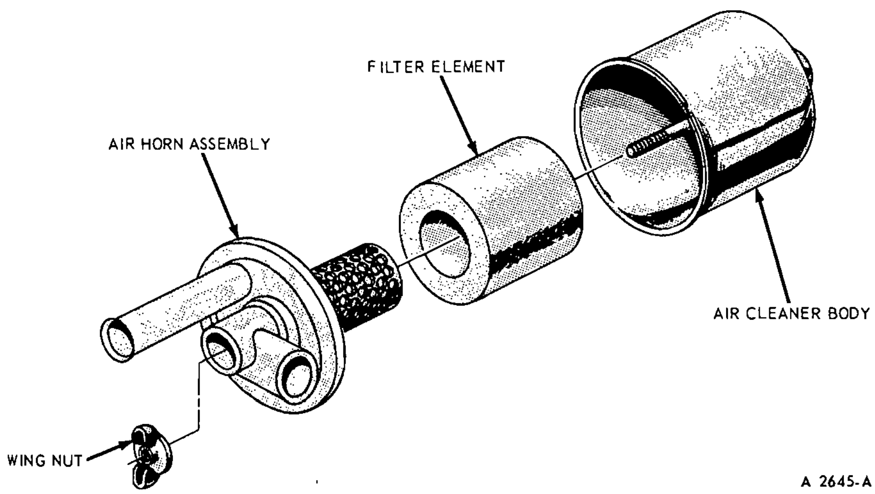


FIG. 18—Thermactor Exhaust Emission System Air Cleaner

proper air pump operation. A belt that is too tight places a severe strain on the air pump bearings.

Properly tensioned drive belts minimize noise and also prolong service life of the belt. Therefore, it is recommended that a belt tension gauge be used to check and adjust the belt tension. **Any belt that has operated for a minimum of 10 minutes is considered a used belt, and when adjusted, it must be adjusted to the reset tension shown in the specifications.**

1. Install the belt tension tool (T63L-8620-A) on the drive belt and check the tension following the instructions of the tool manufacturer. Compare the belt tension to the specified belt tension (Part 8-5) and adjust as necessary.

2. If adjustment is necessary, loosen the air pump mounting and adjusting arm bolts (Fig. 13). Move the air pump toward or away from the engine until the correct tension is obtained. **Use a suitable bar and pry against the pump rear cover** to hold belt tension while tightening the mounting bolts. **Do not pry against the pump housing.** Remove the gauge. Tighten the air pump adjusting arm and mounting bolts. Install the tension gauge and check the belt tension.

THERMACTOR AIR PUMP AIR CLEANER ELEMENT REPLACEMENT

1. Remove the wing nut (Fig. 18) and cover assembly. Remove the filter element from the cover assembly.

2. Wipe the cover assembly and air cleaner with a clean, lint-free cloth to remove any accumulated dirt or foreign matter. Under extremely dirty conditions it may be necessary to wash both the cover and body in low-volatility mineral spirits. Be sure the parts are dry before installing them.

3. **The filter element is not cleanable. Refer to 1967 Passenger Car Maintenance and Lubrication Manual for the recommended replacement interval.** Place a new filter element on the cover assembly. Position the asesmbled cover and filter element in the air cleaner body. **Be sure the tang is fitted in the slot (Fig. 18).** Install the wing nut.

THERMACTOR AIR CLEANER

REMOVAL

1. Note the position of the air cleaner with respect to the vehicle (or engine) and with respect to the air cleaner mounting bracket.

2. Disconnect the air hose from the air cleaner body. Remove the air cleaner mounting bracket screws and remove the air cleaner.

INSTALLATION

1. Position the air cleaner and mounting bracket assembly in the same way that it was previously installed, and install the mounting bracket screws.

2. Connect the air hose to the air cleaner body.

AIR PUMP DRIVE BELT REPLACEMENT

1. Loosen the air supply pump adjusting arm nut and bolt (Fig. 13). Loosen the air supply pump to mounting bracket nut and bolt, and push the air pump towards the cylinder block. Remove the drive belt.

2. Install a new drive belt. With a suitable bar, **pry against the rear cover of the air pump** to obtain the specified belt tension (refer to Part 8-5), and tighten the adjusting arm bolt and nut. **Do not pry against the pump housing.** Adjust the belt tension (refer to Section 3) as necessary. **Always use a belt tension gauge (Tool T63L-8620-A) to check belt tension.**

3. Tighten the air supply pump to mounting bracket bolt and nut.

BACKFIRE SUPPRESSOR VALVE

REMOVAL

Disconnect the air and vacuum hoses at the backfire suppressor valve body (Fig. 13). Remove the valve to mounting bracket bolts and separate the valve from the mounting bracket.

INSTALLATION

Position the backfire suppressor valve on the mounting bracket, and install the attaching bolts. Be sure the valve is positioned properly (Fig. 13), and connect the air and vacuum hoses.

THERMACTOR CHECK VALVE REPLACEMENT

1. Disconnect the air supply hose at the valve. Remove the check valve assembly (the valve has a standard, right-hand pipe thread).

2. Clean the threads on the air manifold adapter with a wire brush. Install the check valve and torque it to specifications. Connect the air supply hose.

THERMACTOR AIR MANIFOLD

REMOVAL

1. Disconnect the air supply hose at the check valve and position the hose out of the way.

2. Loosen all of the air manifold to cylinder head tube coupling nuts (compression fittings). Then unscrew each one until it is free of the cylinder head. Grasp the air manifold at each end and pull it away from the cylinder head. Follow the same procedure to remove the other air manifold, if the engine is so equipped.

INSTALLATION

1. Position the air manifold(s) on the cylinder head. Be sure all the tube coupling nuts are aligned with the

cylinder head. Screw each coupling nut into the cylinder head 1 to 2 threads. Tighten the tube coupling nuts.

2. Connect the air supply hose to the air manifold.

THERMACTOR AIR DELIVERY TUBE REPLACEMENT

Normally, air delivery tubes would be replaced as necessary during cylinder head overhaul. An air delivery tube may be replaced without removing the cylinder head by removing the air manifold and using a hooked tool to pull the tube from the casting.

For cleaning and inspection of the air delivery tubes, refer to Part 8-1, Section 3. Additionally, the air tubes could be inspected for badly eroded tips with the aid of a mirror, when the exhaust manifold(s) is removed.

AIR PUMP DRIVE PULLEY REPLACEMENT

1. Loosen the air supply pump adjusting arm and mounting bolts and nuts to relieve the belt tension.

2. Remove the drive pulley attaching bolts and pull the drive pulley off the air pump shaft.

3. Position the drive pulley on the air supply pump shaft, and install the retaining bolts. Torque the bolts in sequence, across from each other, to specifications.

4. Position the drive belt and adjust the belt tension (Section 3) to specifications. Tighten the adjusting arm and mounting bolts and nuts.

AIR PUMP RELIEF VALVE REPLACEMENT

Do not disassemble the air pump to replace the relief valve, but remove it from the engine.

1. Position Tool T66L-9A486-D on the air pump and remove the relief valve with the aid of a slide hammer (T59L-100-B).

2. Position the relief valve on the pump housing and hold Tool T66L-9A486-B on the relief valve. Use a hammer to **tap the tool lightly** until, the relief valve is seated.

RELIEF VALVE PRESSURE-SETTING PLUG

REMOVAL

1. Remove the relief valve silencer.

2. Using a small screwdriver, bend the three locking tabs inward and remove the plug.

INSTALLATION

1. Before installing the new plug, be sure that the plug is the correct one. The correct plug for this engine should be color-coded green.

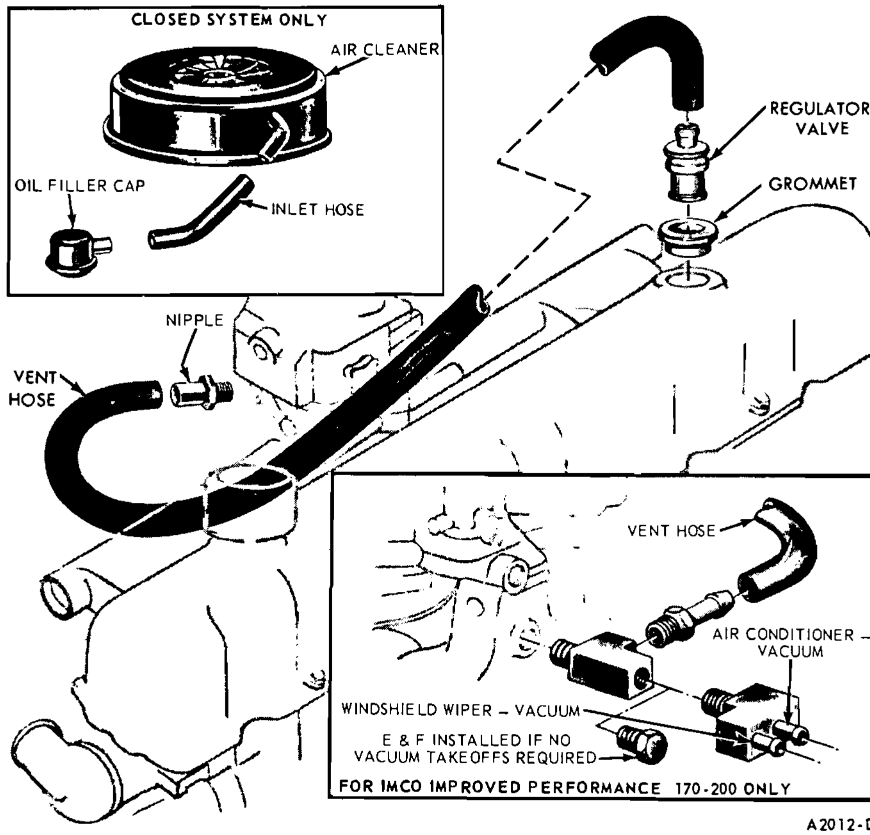


FIG. 19—Positive Crankcase Ventilation System Components

2. Insert the plug in the relief valve hole.

3. Using a 1/4 inch diameter rod, push the plug in until the three locking tabs are spread out on the under side of the relief valve cover. The three depth control tabs should be seated on the top of the relief valve cover.

4. Install the relief valve silencer.

THERMACTOR AIR SUPPLY PUMP

REMOVAL

1. Disconnect the air inlet and outlet hoses at the air pump.

2. Loosen the adjusting arm to air pump and air pump to mounting bracket bolts to relieve the drive belt tension.

3. Disengage the drive belt. Remove the mounting bolts and air pump.

REPAIR

For disassembly and repair procedures, refer to Section 4 of this part.

INSTALLATION

1. Position the air pump on the mounting bracket and install the mounting bolt and nut.

2. Place the drive belt in the pulleys and attach the adjusting arm to the air pump. Adjust the drive belt tension to specifications and tighten the adjusting arm and mounting bolts.

3. Connect the air inlet and outlet hoses to the air pump.

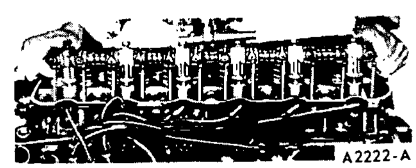


FIG. 20—Valve Rocker Arm Shaft Removal

EXHAUST MANIFOLD

REMOVAL

1. Remove the air cleaner. Disconnect the muffler inlet pipe from the exhaust manifold.

2. Bend the exhaust manifold retaining bolt lock tabs back and remove the retaining bolts. Remove the exhaust manifold.

CLEANING AND INSPECTION

Refer to Part 8-1, Section 3 for the cleaning and inspection procedures.

INSTALLATION

1. Clean the mating surfaces of the exhaust manifold and cylinder head. Scrape the gasket material from the mounting flange of the exhaust manifold and muffler inlet pipe.

2. Apply graphite grease to the mating surface of the exhaust manifold.

3. Position the exhaust manifold on the cylinder head and install the retaining bolts and tab washers. Working from the center to the ends, torque the bolts to specifications. Lock the bolts by bending one tab of the washer over a flat on the bolt.

4. Place a new gasket on the muffler inlet pipe. Position the muffler inlet pipe to the manifold. Install and torque the retaining nuts to specifications.

5. Install the air cleaner. Start the engine and check for exhaust leaks.

POSITIVE CRANKCASE VENTILATION SYSTEM

The positive crankcase ventilation system components are shown in Fig. 19.

REMOVAL

1. On a closed ventilation system, remove the inlet hose from the air cleaner and the oil filler cap.

2. Remove the air cleaner.

3. Grasp the crankcase vent hose near the rocker arm cover grommet and pull the regulator valve from the rocker arm cover.

4. Remove the regulator valve from the vent hose and remove the vent hose from the hose fitting in the carburetor spacer.

CLEANING AND INSPECTION

Refer to Part 8-1, Section 3 for the cleaning and inspection procedures.

INSTALLATION

1. Install the vent hose on the fitting in the carburetor spacer and the regulator valve in the hose.

2. Insert the regulator valve into the rocker arm cover mounting grommet.

3. Install the air cleaner.

4. On a closed ventilation system, connect the inlet hose to the air cleaner and the oil filler cap.

5. Operate the engine and check for leaks.

VALVE ROCKER ARM SHAFT ASSEMBLY

REMOVAL

1. Remove the air cleaner and the crankcase ventilation system.

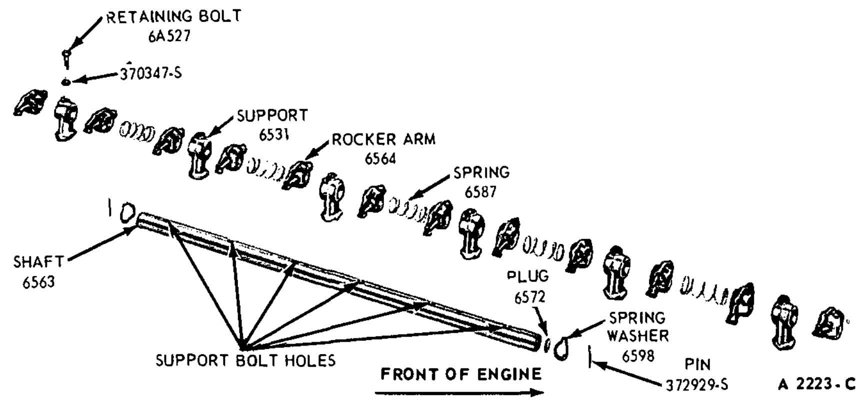


FIG. 21—Valve Rocker Arm Shaft Assembly

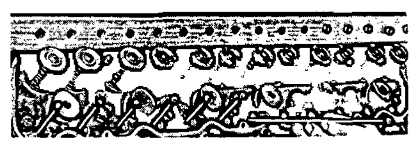


FIG. 22—Valve Push Rod Removal

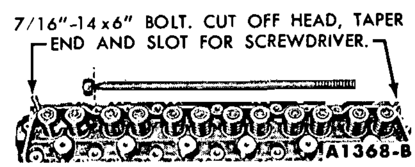


FIG. 23—Cylinder Head Guide Studs

2. If equipped with a Thermactor exhaust emission control system, disconnect the air hoses as necessary for accessibility and position them out of the way.

3. Remove the valve rocker arm cover and discard the gasket.

4. Remove the rocker arm shaft support bolts by loosening the bolts two turns at a time in sequence. Remove the rocker arm shaft assembly (Fig. 20). Remove the valve push rods. **Make sure the push rods are identified before removal so they can be returned to the same location when they are installed.**

INSTALLATION

1. Apply Lubriplate to both ends of the push rods and to the valve stem tip.

2. Install the valve push rods. Position the valve rocker arm shaft assembly on the cylinder head.

3. Install and tighten all valve rocker arm support bolts, two turns at a time in sequence, until the supports fully contact the cylinder head. Torque the bolts to specifications.

4. If any part which could affect the valve clearance has been changed, check the valve clearance following the procedure outlined under Valve Clearance — 170 and 200 Six (Part 8-1, Section 2).

5. Clean the valve rocker arm cover and cylinder head gasket surfaces. Coat one side of a new gasket with an oil resistant sealer and lay the cemented side of the gasket in place on the cover. Install the cover,

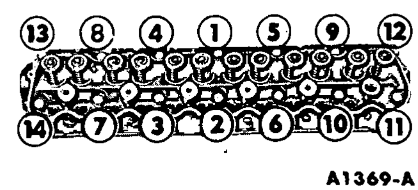


FIG. 24—Cylinder Head Bolt Torque Sequence

making sure the gasket seats evenly around the head. Tighten the cover retaining bolts in two steps. First, torque the bolts to specifications; then, retorque to the same specifications two minutes after initial tightening.

6. If equipped with a Thermactor exhaust emission control system, connect the air hoses.

7. Install the crankcase ventilation system and the air cleaner.

DISASSEMBLY

1. Remove the pin and spring washer from each end of the valve rocker arm shaft.

2. Slide the valve rocker arms, springs, and supports off the shaft. Be sure to identify the parts.

3. If it is necessary to remove the plugs from each end of the shaft, drill or pierce the plug on one end. Use a steel rod to knock out the plug on the opposite end. Working from the open end, knock out the remaining plug.

CLEANING AND INSPECTION

Refer to Part 8-1, Section 3 for the cleaning and inspection procedures.

REPAIRS

Refer to Part 8-1, Section 2 for the repair procedures.

ASSEMBLY

1. Lubricate all parts with engine oil. Apply Lubriplate to the valve and push rod ends of the rocker arm.
2. If the plugs were removed from the ends of the shaft, use a blunt tool or large diameter pin punch and install a plug, cup side out, in each end of the shaft.
3. Install the spring washer and pin on one end of the shaft.
4. Install the valve rocker arms, supports, and springs in the order shown in Fig. 21. **Be sure the oil holes in the shaft are facing downward. Complete the assembly by installing the remaining spring washer and pin.**

CYLINDER HEAD

REMOVAL

1. Drain the cooling system. Remove the air cleaner. Disconnect the upper radiator hose at the engine.
2. Disconnect the muffler inlet pipe at the exhaust manifold. Pull the muffler inlet pipe down. Remove the gasket.
3. Disconnect the accelerator retracting spring. Disconnect the accelerator rod at the carburetor.
4. On IMCO exhaust emission equipped engines, disconnect the transmission kickdown rod. Disconnect the accelerator linkage at the bellcrank assembly.
5. Disconnect the fuel inlet line at the fuel filter hose, and the distributor vacuum line at the carburetor.
6. Disconnect the coolant lines at the carburetor spacer.
7. Disconnect the distributor vacuum line at the distributor. Disconnect the carburetor fuel inlet line at the fuel pump. Remove the lines as an assembly.
8. Disconnect the spark plug wires at the spark plugs and the temperature sending unit wire at the sending unit.
9. Remove the crankcase ventilation system. Remove hoses from the Thermactor exhaust emission control system as necessary for accessibility.
10. Remove the valve rocker arm cover.
11. Remove the valve rocker arm shaft assembly. Remove the valve push rods in sequence (Fig. 22).
12. Remove the remaining cylinder head bolts and remove the cylinder head. **Do not pry between the cylinder head and block as the gasket surfaces may become damaged.**

INSTALLATION

1. Clean the head and block gasket surfaces. (Refer to Part 8-1, Section 3, for cleaning and inspection procedures.) If the cylinder head was removed for a gasket change, check the flatness of the cylinder head and block. Install guide studs at each end of the cylinder block (Fig. 23).
2. On the 170 Six engine, apply cylinder head gasket sealer to both sides of a new gasket. Spread the sealer evenly over the entire gasket surface. **Do not apply sealer to a 200 Six engine head gasket.** Position the gasket over the guide studs on the cylinder block.
3. Install a new gasket on the flange of the muffler inlet pipe.
4. Lift the cylinder head over the guides and slide it down carefully, guiding the exhaust manifold studs into the muffler inlet pipe.
5. Install, but do not tighten two bolts at opposite ends of the head to hold the head and gasket in position. Remove the guides and install the remaining bolts.
6. The cylinder head bolts are tightened in three progressive steps. Torque all the bolts in sequence (Fig. 24) to 55 ft-lbs, then to 65 ft-lbs. and finally to specifications. When cylinder head bolts have been tightened following this procedure, it is not necessary to retorque the bolts after extended operation. However, on cylinder heads with composition gaskets, the bolts may be checked and retorqued, if required. **After the cylinder head bolts have been torqued to specifications, the bolts should not be disturbed.**
7. Apply Lubriplate to both ends of the push rods. Install the push rods in their original bores, positioning the lower end of the rods into the tappet sockets. Apply Lubriplate to the valve stem tips and to the rocker arm pads.
8. Install the valve rocker arm shaft assembly following steps 1 thru 7 under Valve Rocker Arm Shaft Installation.

Check the valve clearance, following the procedure outlined under Valve Clearance (Part 8-1, Section 2).

9. Install the muffler inlet pipe lock washers and retaining nuts. Torque the nuts to specifications.
10. Connect the radiator upper hose at the coolant outlet housing. Connect the coolant hoses at the carburetor spacer.
11. Position the distributor vacuum line and the carburetor fuel inlet line on the engine. Connect the fuel line at the fuel filter using a new clamp; then connect the distributor vacuum line at the carburetor.
12. On IMCO exhaust emission equipped engines, connect the accelerator linkage at the bellcrank assembly. Connect the transmission kickdown rod.
13. Connect the accelerator rod retracting spring. Connect the accelerator rod at the carburetor.
14. Connect the distributor vacuum line at the distributor. Connect the carburetor fuel inlet line at the fuel pump.
15. Connect the temperature sending unit wire at the sending unit. Connect the spark plug wires. **Be sure the wires are forced all the way down into their sockets.**
16. Fill and bleed the cooling system.
17. Install the crankcase ventilation system. Install the hoses on the Thermactor exhaust emission control system.
18. Start the engine and check for coolant and oil leaks.

DISASSEMBLY

1. Remove the Thermactor exhaust emission control system components. Remove deposits from the combustion chambers and valve heads with a scraper and a wire brush before removing the valves. **Be careful not to scratch the cylinder head gasket surfaces.**
2. Compress the valve springs (Fig. 25). Remove the valve retainer locks and release the spring. If the valve locks are stuck, place a piece of steel tubing (3/4-inch OD, 1/2-inch ID and 3-inches long) over the end of the valve stem squarely against the sleeve surface. Tap the tube with a steel hammer to dislodge the locks.
3. Remove the sleeve, spring retainer, stem seal, and valve. Discard the valve stem seals. Identify all valve parts. If the cylinder head is to be replaced, remove the manifold assembly.

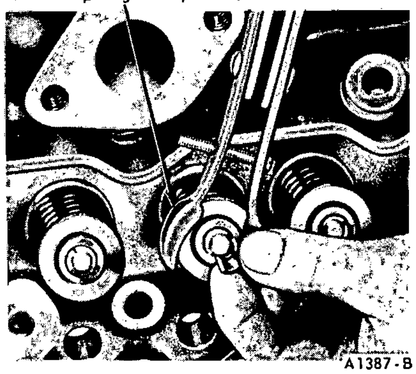


FIG. 25—Compressing Valve Spring—On Bench

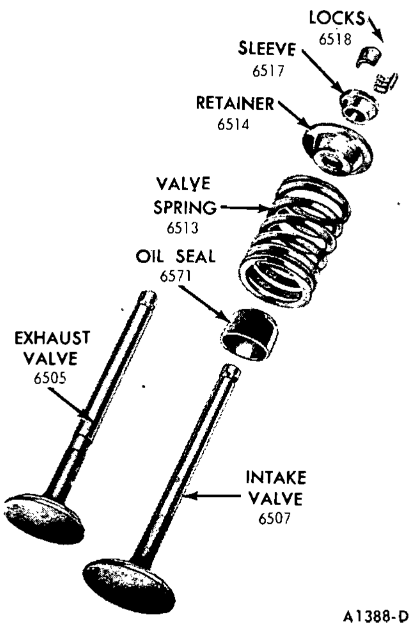


FIG. 26—Typical Valve Assembly

CLEANING AND INSPECTION

Refer to Part 8-1, Section 3 for the cleaning and inspection procedures.

REPAIRS

Refer to Part 8-1, Section 2 for repair procedures.

ASSEMBLY

1. If the cylinder head is being replaced, install the manifold assembly. Lubricate the valve guides and valve stems with engine oil. Apply Lubriplate to the tip of the valve stems.

2. Install each valve (Fig. 26) in the valve guide from which it was removed or to which it was fitted. Install a new stem seal on the valve.

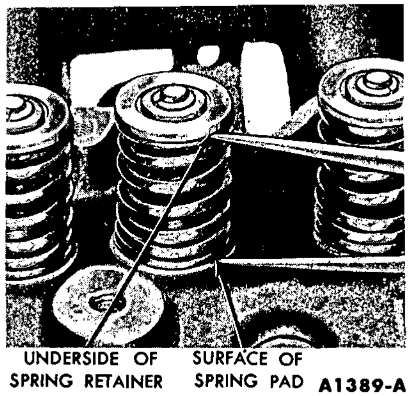


FIG. 27—Valve Spring Assembled Height

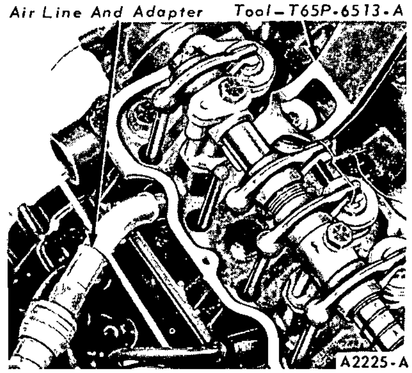


FIG. 28—Compressing Valve Spring—In Chassis

3. Install the valve spring assembly over the valve. Install the spring retainer and sleeve.

4. Compress the spring and install the retainer locks (Fig. 25).

5. Measure the assembled height of the valve spring from the surface of the cylinder head spring pad to the underside of the spring retainer with dividers (Fig. 27).

6. Check the dividers against a scale. If the assembled height is greater than specifications, install the necessary 0.030-inch thick spacer(s) between the cylinder head spring pad and the valve spring to bring the assembled height to the recommended dimension. **Do not install spacers unless necessary. Use of spacers in excess of recommendations will result in overstressing the valve springs and overloading the camshaft lobes which would lead to spring breakage and worn camshaft lobes.**

Install the Thermactor exhaust emission control components.

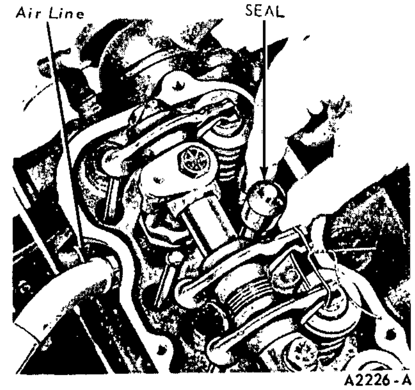


FIG. 29—Valve Stem Seal Removal

VALVE SPRING, RETAINER AND STEM SEAL REPLACEMENT

Broken valve springs or defective valve stem seals and retainer may be replaced without removing the cylinder head, provided damage to the valve or valve seat has not occurred.

1. Remove the air cleaner. Remove the crankcase ventilation regulator valve from the valve rocker arm cover. If equipped with a Thermactor exhaust emission control system, disconnect the air hoses as necessary for accessibility. Remove the valve rocker arm cover. Remove the applicable spark plug.

2. Loosen the valve rocker arm shaft support bolts 2 turns at a time, in sequence, until the valve spring pressure is relieved. Remove both valve push rods of the cylinder to be serviced.

3. Install an air line with an adapter in the spark plug hole.

4. Tighten the retaining bolts just enough to seat the rocker arm shaft supports on the cylinder head. Push the rocker arm to one side and secure it in this position (Fig. 28). To move the rocker arm on either end of the shaft, it will be necessary to remove the retaining pin and spring washer and slide the rocker arm off the shaft.

5. Turn on the air supply. **Air pressure may turn the crankshaft until the piston reaches the bottom of its stroke.** Using the valve spring compression tool shown in Fig. 28, compress the valve and remove the valve spring retainer locks, the sleeve, spring retainer and the valve spring. **If air pressure fails to hold the valve in the closed position during this operation, it can be presumed that the valve is not seating or is damaged. If this condition occurs, remove the cylinder head for further inspection.**

6. Remove the valve stem seal (Fig. 29). **If air pressure has forced the piston to the bottom of the cylinder, any removal of air pressure will allow the valve(s) to fall into the cylinder. A rubber band, tape or string wrapped around the end of the valve stem will prevent this condition and will still allow enough travel to check the valve for binds.**

7. Install a new valve stem seal. Position the spring over the valve. Install the spring retainer and sleeve. Compress the valve spring and install the valve spring retainer locks.

8. Apply Lubriplate to both ends of the push rod, the valve and push rod ends of the rocker arm, and the valve stem tip. Remove the rocker arm shaft and install the push rod(s), making sure the lower end of the rod is positioned in the valve lifter push rod cup.

9. Remove the wire securing the valve rocker arm and slide the rocker arm into position. If an end valve rocker arm was removed, slide it into position on the shaft and install the spring washer and retaining pin. Turn off the air and remove the air line and adapter. Install the spark plug and spark plug wire.

10. Install the rocker arm shaft by following the instructions under Rocker Arm Shaft Assembly Installation.

11. Clean the valve rocker arm cover and cylinder head gasket surfaces. Coat one side of a new gasket with an oil-resistant sealer and lay the cemented side of the gasket on the cover. Install the cover making sure the gasket seats evenly around the head. Tighten the cover retaining bolts in two steps. First, torque the bolts to specifications. Two minutes later, torque the bolts to the same specifications.

12. If equipped with a Thermactor exhaust emission control system, connect the air hoses.

13. Insert the regulator valve (with the vent hose attached) into the valve rocker arm cover mounting grommet. Install the air cleaner.

WATER PUMP

REMOVAL

1. Drain the cooling system.

On a vehicle with power steering, remove the power steering drive belt.

On a vehicle with air conditioning, remove the compressor drive belt.

2. Disconnect the radiator lower hose at the water pump. Remove the drive belt, fan, or fan and drive clutch, and water pump pulley.

3. Disconnect the heater hose at the water pump.

4. Remove the water pump.

INSTALLATION

Before a water pump is re-installed, check it for damage. If it is damaged and requires repair, replace it with a new pump or install a rebuilt pump obtained from a Ford-Authorized Reconditioner.

1. If a new water pump is to be installed, remove the heater hose fitting from the old pump and install it on the new pump. Clean the gasket surfaces on the water pump and cylinder block.

2. Coat a new gasket on both sides with water-resistant sealer and position it on the cylinder block.

3. Position the water pump in place and install the lock washers and retaining bolts (the alternator adjusting arm is retained by one water pump bolt). Torque the bolts to specifications.

4. Connect the radiator lower hose and the heater hose to the water pump.

5. Install the water pump pulley and fan or fan and drive clutch. Torque the bolts evenly and alternately to specifications.

6. Install the drive belt and adjust the tension to specifications.

On a vehicle with power steering, install the drive belt and adjust the tension to specifications.

On a vehicle with air conditioner, install the compressor drive belt and adjust the tension to specifications.

7. Fill and bleed the cooling system. Operate the engine until normal operating temperature is reached. Check for leaks and check the coolant level.

CYLINDER FRONT COVER AND TIMING CHAIN

REMOVAL

1. Drain the cooling system and the crankcase. Disconnect the radiator upper hose at the coolant outlet housing and the radiator lower hose at the water pump. On a vehicle with automatic transmission, disconnect the transmission oil cooler lines from the radiator.

2. Remove the radiator. Remove the drive belt, fan and pulley. On a vehicle with air conditioning remove the condenser retaining bolts and position the condenser forward. **Do not disconnect the refrigerant lines.** Remove the compressor drive belt. On a vehicle equipped with Thermactor exhaust emission control system remove the air supply pump drive belt. If so equipped, remove the accessory drive pulley. Using tool T58P-6316-A, remove the crankshaft damper.

3. Remove the cylinder front cover and gasket. Remove the crankshaft front oil slinger.

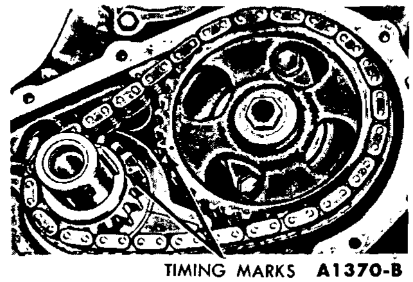


FIG. 30—Aligning Timing Marks

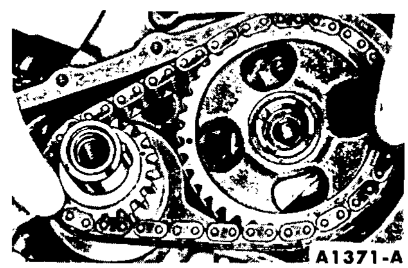


FIG. 31—Timing Chain and Sprockets Removal

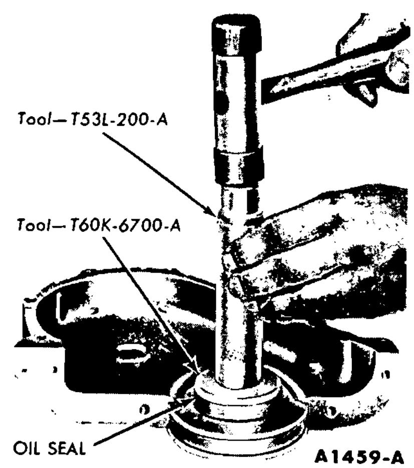


FIG. 32—Crankshaft Front Oil Seal Replacement

4. Rotate the crankshaft in a clockwise direction (as viewed from the front) to take up the slack on the left side of the chain.

5. Establish a reference point on the block and measure from this point to the chain. Rotate the crankshaft in the opposite direction to take up the slack on the right side of the chain. Force the left side of the chain out with the fingers and measure the distance between the reference point and the chain. The

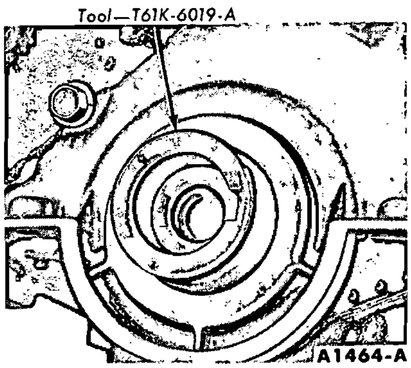


FIG. 33—Cylinder Front Cover

deflection is the difference between the two measurements. If the deflection extends 1/2 inch, replace the timing chain and sprockets.

6. Crank the engine until the timing marks are aligned as shown in Fig. 30. Remove the camshaft sprocket retaining bolt and washer. Slide both sprockets and timing chain forward and remove them as an assembly (Fig. 31).

7. Remove the oil pan and related parts.

FRONT OIL SEAL REPLACEMENT

It is good practice to replace the oil seal each time the cylinder front cover is removed.

1. Drive out the oil seal with a pin punch. Clean the recess in the cover.

2. Coat a new seal with grease and install the seal. Drive the seal in until it is fully seated in the recess, (Fig. 32). Check the seal after installation to be sure the spring is properly positioned in the seal.

CLEANING AND INSPECTION

Refer to Part 8-1, Section 3 for the cleaning and inspection procedures. Clean the crankshaft damper following the referenced procedures.

INSTALLATION

1. Oil the timing chain. Position the sprockets and timing chain on the camshaft and crankshaft. Be sure the timing marks on the sprockets and chain are positioned as shown in Fig. 26. Install the camshaft sprocket retaining bolt and washer. Torque the bolt to specifications. Install the oil slinger so that the raised side of the embossed pointer is facing outward.

2. Clean the cylinder front cover and the gasket surface of the cylinder block. Apply oil-resistant sealer to a new cylinder front cover gasket and position the gasket on the cylinder front cover. Install the cylinder front cover using the tool shown in Fig. 33. Torque the retaining bolts to specifications.

3. Lubricate the hub of the crankshaft damper with Lubriplate to prevent damage to the seal during installation or initial engine start. Using tool T52L-6306-AEE, install the crankshaft damper. Torque the retaining bolt to specifications.

4. Install the oil pan and related parts.

5. Install the fan, pulley and drive belt. Adjust the drive belt.

6. Install the radiator. Connect the radiator upper and lower hoses.

7. Fill and bleed the cooling system. Fill the crankcase with the proper quantity and grade of engine oil.

8. Start the engine and check the ignition timing. Operate the engine at fast idle and check all hose connections and gaskets for leaks.

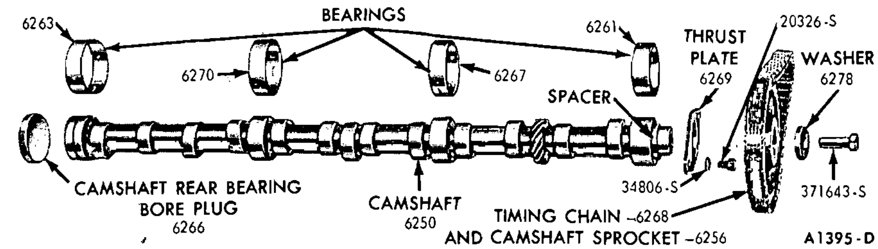


FIG. 34—Camshaft and Related Parts

CAMSHAFT

The camshaft and related parts are shown in Fig. 34.

REMOVAL

1. Drain the cooling system and the crankcase. Remove the air cleaner. If equipped with a Thermactor exhaust emission control system, disconnect the air hoses as necessary for accessibility, and position them out of the way.

2. Disconnect the radiator hoses from the coolant outlet housing and the water pump. Remove the radiator. Remove the grille. On a vehicle with air conditioning, remove the condenser retaining bolts, and position the condenser to one side. **Do not disconnect the condenser refrigerant lines.**

3. On a Mustang, remove the grille center support bracket. Remove the bolts from the left side of the upper and lower stone shields. If necessary, loosen the bolts on the right side of the stone shields and raise the stone shields out of the way to remove the camshaft.

4. Disconnect the accelerator rod retracting spring. Disconnect the accelerator rod from the carburetor.

5. Disconnect the fuel inlet line at the fuel filter, and the distributor vacuum line from the carburetor.

6. Disconnect the coolant hoses from the carburetor spacer.

7. Disconnect the muffler inlet pipe from the exhaust manifold. Pull the muffler inlet pipe down. Remove the gasket.

8. Disconnect the distributor vacuum line from the distributor. Disconnect the carburetor fuel inlet line from the fuel pump. Remove the lines as an assembly.

9. Disconnect the spark plug wires from the spark plugs and the coil high tension lead at the coil. Remove the distributor cap and spark plug wires as an assembly. Disconnect the primary wire from the coil and remove it from the retaining clip on the cylinder head.

10. Disconnect the engine temperature sending unit wire from the sending unit. Disconnect the flexible fuel line from the fuel tank line and plug the line. Remove the distributor, the fuel pump, and the oil filter.

11. Remove the crankcase vent hose, regulator valve, valve rocker arm cover and cylinder head by following steps 9 thru 12 under Cylinder Head Removal.

12. Using a magnet, remove the valve lifters and keep them in order so that they can be installed in their original location (Fig. 35).

13. Loosen and remove the drive belt, fan and pulley. Remove the crankshaft damper using tool T58P-6316-A.

14. Remove the oil level dipstick. Remove the oil pan. Remove the oil pump and inlet tube assembly.

15. Remove the cylinder front cover and gasket. Remove the crankshaft front oil slinger.

16. Push the camshaft toward the rear of the engine. Install a dial indicator so that the indicator point is on the camshaft sprocket cap screw (Fig. 36). Zero the dial indicator. Position a large screw driver be-

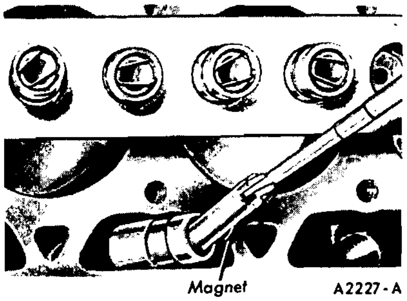


FIG. 35—Valve Lifter Removal

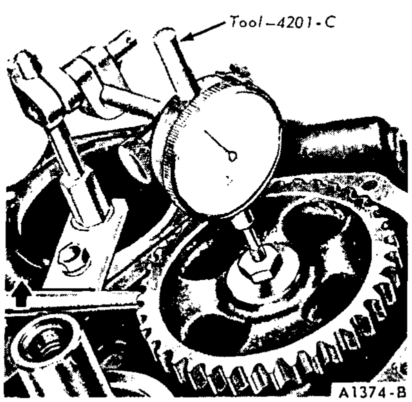


FIG. 36—Camshaft End Play

tween the camshaft sprocket and the block. Pull the camshaft forward and release it. Compare the dial indicator reading with specifications. If the end play is excessive, replace the thrust plate.

17. Remove the dial indicator. Remove the timing chain and sprockets following steps 4 and 5 under Cylinder Front Cover and Timing Chain Removal.

18. Remove the camshaft thrust plate. Carefully remove the camshaft by pulling it toward the front of the engine. **Use caution to avoid damaging the journals and lobes.**

INSTALLATION

1. Clean the oil passage that feeds the rocker arm shaft by blowing compressed air into the opening in the block. Oil the camshaft journals and apply Lubriplate to all the camshaft lobes. Carefully slide the camshaft through the bearings.

2. Install the thrust plate with the oil groove toward the rear of the engine and torque the retaining bolts to specifications. Replace the crankshaft front oil seal.

3. Follow steps 1, 2 and 3 under Cylinder Front Cover and Timing Chain Installation and install the sprockets and timing chain, oil slinger, cylinder front cover and crankshaft damper.

4. Clean the oil pump inlet tube screen, oil pan, and block gasket surfaces. Prime the oil pump and install the pump inlet tube.Install the oil pump and oil pan. Install the oil level dipstick.

5. Install the fan, fan pulley and drive belt. Adjust the belt tension. Install the radiator and the grille.

On a Mustang, install the bolts in the upper and lower stone shields, and install the grille, grille center support bracket and bumper.

6. Dip the valve lifter foot in Lubriplate. Coat the remainder of each valve lifter with engine oil. Install the valve lifters in their original bores.

7. Install the cylinder head, push rods and the valve rocker arm shaft assembly by following steps 1 thru 9 under Cylinder Head Installation.

8. Using a new gasket, install the fuel pump and connect the flexible fuel line. Install the oil filter.

9. Position the No. 1 piston at TDC after the compression stroke. Position the distributor in the block with the rotor at the No. 1 firing position and the breaker points open. Install the distributor hold down clamp.

10. Connect the engine temperature sending unit wire. Connect the coil primary wire. Install the distributor cap. Connect the spark plug wires and the coil high tension lead.

11. Install the carburetor fuel inlet line, using a new clamp on the filter tubing. Connect the distributor vacuum line to the carburetor.

12. On a vehicle with air conditioning, position the condenser and install the retaining bolts. Install the radiator and connect the radiator upper and lower hoses. Connect the coolant hoses to the carburetor spacer.

13. Connect the accelerator rod retracting spring. Connect the accelerator rod at the carburetor. If equipped with a Thermactor exhaust emission control system, connect the air hoses.

14. Fill and bleed the cooling system. Fill the crankcase.

15. Start the engine and check and adjust the ignition timing. Connect the distributor vacuum line to the distributor. Check for coolant and oil leaks. Adjust the engine idle speed and the idle fuel mixture.

CAMSHAFT REAR BEARING BORE PLUG REPLACEMENT

1. On a vehicle with a manual-shift transmission, slide the transmission to the rear and remove the clutch pressure plate and disc following the procedure in Group 5.

On a vehicle with automatic transmission, remove the transmission and converter housing following the procedure in Group 7.

2. Remove the flywheel retaining bolts and remove the flywheel and engine rear cover plate.

3. Drill a 1/2-inch hole in the camshaft rear bearing bore plug and use tool T58L-101-A to remove the plug (Fig. 37).

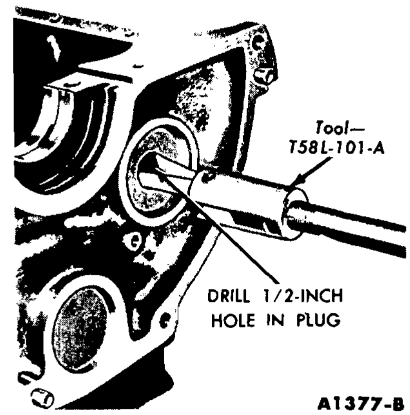


FIG. 37—Camshaft Rear Bearing Bore Plug Removal

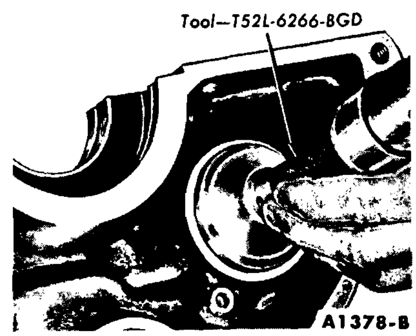


FIG. 38—Camshaft Rear Bearing Bore Plug Installation

4. Clean out the plug bore recess thoroughly.

5. Coat the flange of a new plug with oil resistant sealer and install it with the flange facing out and slightly below the chamfer in the bore (Fig. 38).

6. Install the engine rear cover plate, apply oil-resistant sealer to the flywheel bolts and install the flywheel.

On a vehicle with a manual-shift transmission, install the clutch pressure plate, disc, and transmission following the procedure in Group 5.

On a vehicle with automatic transmission install the transmission and converter housing following the procedure in Group 7.

HYDRAULIC VALVE LIFTER

REPLACEMENT

1. Remove the cylinder head and related parts following the procedure under Cylinder Head Removal.
2. Using a magnet, remove the valve lifters (Fig. 35). Place the lifters in a rack so they can be installed in their original positions.

If the lifters are stuck in their bores by excessive varnish or gum, it may be necessary to use a plier-type tool to remove the lifters. Rotate the lifter back and forth to loosen the gum and varnish which may have formed on the lifter.

The internal parts of each hydraulic valve lifter assembly are matched sets. Do not intermix the parts. Keep the assemblies intact until they are to be cleaned.

3. Install new (or cleaned) hydraulic valve lifters through the push rod openings with a magnet (Fig. 35).
4. Install the cylinder head and related parts.

DISASSEMBLY

Each valve lifter is a matched assembly; therefore, the parts are not interchangeable. Disassemble and assemble each lifter carefully, keeping the assemblies in proper sequence so they will be installed in their original bores.

1. Grasp the lock ring with needle nose pliers to release it from the groove. It may be necessary to depress the plunger to fully release the lock ring.
2. Remove the push rod cup, plunger and spring.
3. Invert the plunger assembly and remove the check valve retainer by carefully prying up on it with a screwdriver. Remove the check valve and spring.

CLEANING AND INSPECTION

Refer to Part 8-1, Section 3 for the cleaning and inspection procedures.

ASSEMBLY

A typical hydraulic valve lifter assembly is shown in Fig. 39.

1. Place the plunger upside down on a clean work bench.
2. Place the check valve in position over the oil hole on the bottom of the plunger. Set the check valve spring on top of the check valve.
3. Position the check valve retainer over the check valve and spring and push the retainer down into place on the plunger.
4. Place the plunger spring and then the plunger (open end up) into the tappet body.
5. Place the push rod seat in the plunger.
6. Depress the plunger and position the closed end of the lock ring in the lifter body groove. Release the plunger; then depress it again to fully seat the lock ring.

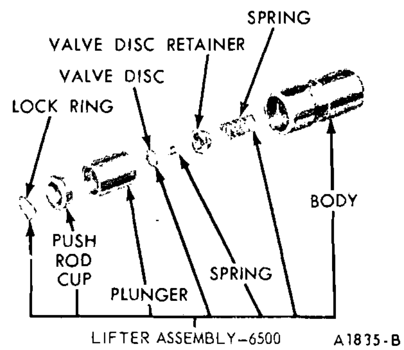


FIG. 39—Typical Valve Lifter Assembly

MAIN AND CONNECTING ROD BEARING REPLACEMENT

The main bearing inserts are selective fit. **Do not file or lap bearing caps or use bearing shims to obtain the proper bearing clearance.**

Selective fit main bearings are available for service in standard sizes and 0.002 inch undersize. Standard bearings are divided into two sizes and are identified by a daub of red or blue paint. Refer to the Parts Catalog for the available sizes. **Red marked bearings increase the clearance; blue marked bearings decrease the clearance.** Undersize bearings, which are not selective fit, are available for use on journals that have been refinished.

MAIN BEARING

1. Drain the crankcase. Remove the oil level dipstick. Remove the oil pan and related parts.
2. Remove the oil pump inlet tube assembly and the oil pump.
3. **Replace one bearing at a time, leaving the other bearings securely fastened.** Remove the main bearing cap to which new bearings are to be installed.
4. Insert the upper bearing removal tool (tool 6331) in the oil hole in the crankshaft.
5. Rotate the crankshaft in the direction of engine rotation to force the bearing out of the block.

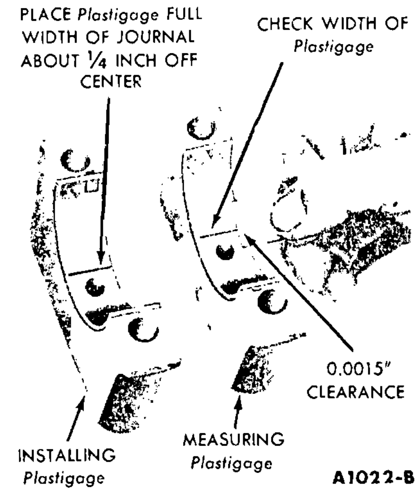


FIG. 40—Installing and Measuring Plastigage—Engine Installed

6. Clean the crankshaft journal. **When replacing standard bearings with new bearings, it is good practice to first try to obtain the proper clearance with two blue bearing halves.**
7. To install the upper main bearing, place the plain end of the bearing over the shaft on the locking tang side of the block and partially install the bearing so that tool 6331 can be inserted in the oil hole in the crankshaft. With tool 6331 positioned in the oil hole in the crankshaft, rotate the crankshaft in the opposite direction of engine rotation until the bearing seats itself. Remove the tool.
8. Install the cap bearing.
9. Support the crankshaft so that its weight will not compress the Plastigage used in Step 10 and provide an erroneous reading. Position a jack so that it will bear against the counterweight adjoining the bearing which is being checked.
10. Place a piece of Plastigage on the bearing surface the full width of the bearing cap and about 1/4 inch off center (Fig. 40).
11. Install the cap and torque the bolts to specifications. **Do not turn the crankshaft while the Plastigage is in place.**
12. Remove the cap. Using the Plastigage scale, check the width of the Plastigage. **When checking the width of the Plastigage, check at the widest point in order to get the minimum clearance. Check at the narrowest point in order to get the maximum clearance. The difference between the two readings is the taper of the journal.**
13. If the clearance is less than

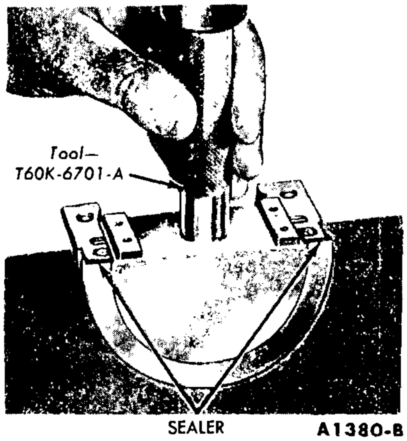


FIG. 41—Seal to Rear Bearing Cap Installation

the specified limits, try two red bearing halves or a combination of red and blue, depending upon the condition.

If the clearance exceeds specified limits, try 0.002 inch undersize bearings in combination with blue or red bearings. **The bearing clearance must be within specified limits. If 0.002 inch undersize main bearings are used on more than one journal, be sure they are all installed in the block.**

If the standard and 0.002 inch undersize bearings do not bring the clearance within the desired limits, refinish the crankshaft journal; then install undersize bearings.

14. If the rear main bearing is replaced, replace the lower oil seal in the rear main bearing cap as follows:

Remove and discard the rear seal. If there is evidence of oil seal leakage, the upper half of the oil seal must also be replaced to assure satisfactory sealing.

Clean the mating surfaces of the block and rear main bearing cap, and the rear journal oil seal groove. Preform the new seal by hand to the approximate radius of the cap.

Insert the seal in the oil seal groove, seating the center of the seal first with the seal extending equally

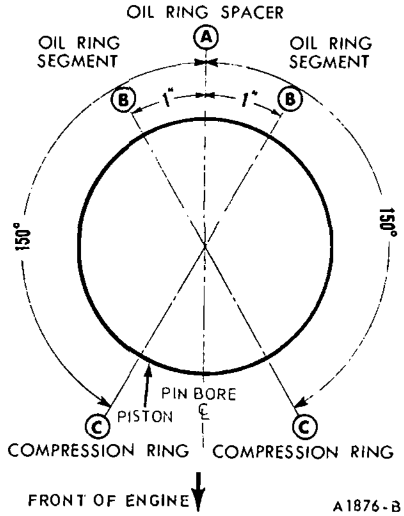


FIG. 43—Piston Ring Gap Spacing

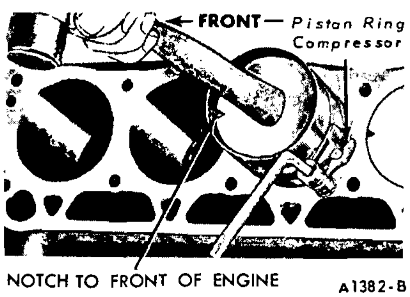


FIG. 44—Piston Installation

on both ends. Press the seal down firmly with the thumb at the center of the seal, then press both ends of the seal into the groove working from the ends to the center.

Position the seal forming tool as shown in Fig. 41 and complete the seal installation. After installation, cut the ends of the seal flush.

Apply a thin coating of oil-resistant sealer to the rear main bearing cap at the rear of the top mating surface (Fig. 41). **Do not apply sealer to the area forward of the oil slinger groove.**

The upper oil seal in the block

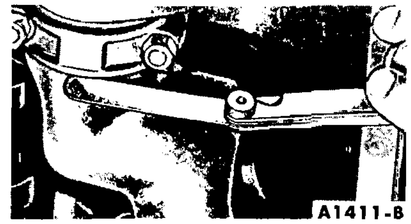


FIG. 45—Typical Connecting Rod Side Clearance

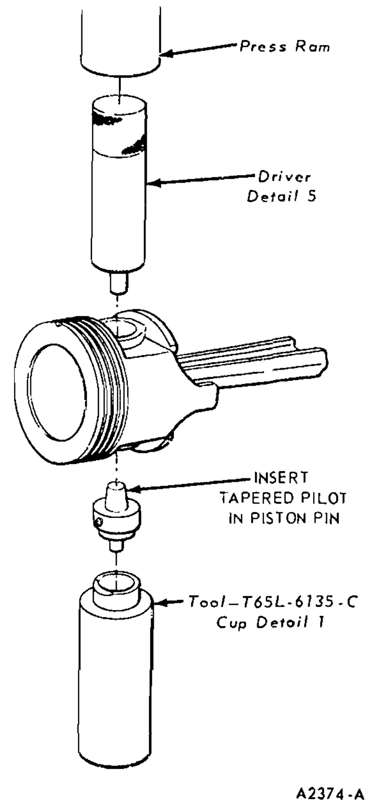


FIG. 46—Piston Pin Removal

cannot be replaced with the crankshaft installed.

15. After the bearing has been fitted, apply a light coat of engine oil to the journal and bearings, then install the bearing cap. Torque the cap bolts to specifications.

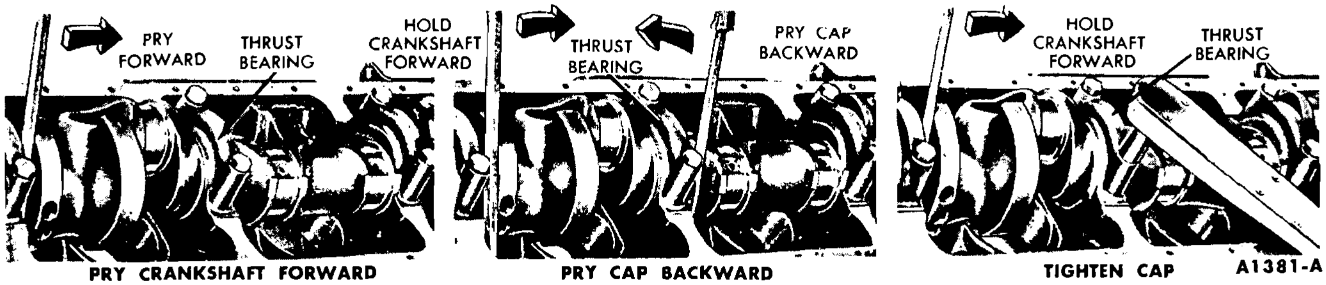


FIG. 42—Typical Thrust Bearing Alignment

16. Repeat the procedure for the remaining bearings that require replacement.

17. If the thrust bearing cap (No. 3 main bearing) has been removed, install it as follows:

Install the thrust bearing cap with the bolts finger-tight. Pry the crankshaft forward against the thrust surface of the upper half of the bearing (Fig. 42). Hold the crankshaft forward and pry the thrust bearing cap to the rear (Fig. 42). This will align the thrust surfaces of both halves of the bearing. Retain the forward pressure on the crankshaft. Torque the cap bolts to specification (Fig. 42).

18. Clean the oil pump inlet tube screen. Prime the oil pump by filling the inlet opening with oil and rotating the pump shaft until oil emerges from the outlet opening. Then install the oil pump and the inlet tube assembly.

19. Position the oil pan gaskets on the oil pan. Position the oil pan front seal on the cylinder front cover. Position the oil pan rear seal on the rear main bearing cap. Install the oil pan and related parts. Install the oil level dipstick.

20. Fill the crankcase. Start the engine and check for oil pressure. Operate the engine at fast idle and check for oil leaks.

CONNECTING ROD BEARING

1. Follow steps 1 and 2 under Main Bearing Replacement.

2. Turn the crankshaft until the connecting rod to which new bearings are to be fitted is down. Remove the connecting rod cap. Remove the bearing inserts from the rod and cap.

3. Be sure the bearing inserts and the bearing bore in the connecting rod and cap are clean. Foreign material under the inserts will distort the bearing and cause a failure.

4. Clean the crankshaft journal.

5. Install the bearing inserts in the connecting rod and cap with the tangs fitting in the slot provided.

6. Pull the connecting rod assembly down firmly on the crankshaft journal.

7. Place a piece of Plastigage on the lower bearing surface, the full width of the cap and about 1/4 inch off center.

8. Install the cap and torque the connecting rod nuts to specification. **Do not turn the crankshaft while the Plastigage is in place.**

9. Remove the cap; then, using the Plastigage scale, check the width of the Plastigage. **When checking the width of the Plastigage, check at the widest point in order to get the minimum clearance. Check at the narrowest point in order to get the maximum clearance. The difference between the two readings is the taper of the journal.**

10. If the clearance is less than the specified service limits, try two red bearing halves or a combination of red and blue depending upon the condition.

If the clearance exceeds the specified limits, try 0.002 inch undersize bearings in combination with blue or red bearings. **The bearing clearance must be within specified limits.**

If proper clearance cannot be achieved with standard or 0.002 undersize bearings, the crankshaft will have to be ground undersize and fitted with undersize bearings.

After the bearing has been fitted, clean and apply a light coat of engine oil to the journal and bearings. Install the connecting rod cap. Torque the nuts to specifications.

11. Repeat the procedure for the remaining connecting rods that require new bearings.

12. Follow steps 18 thru 20 under Main Bearing Replacement.

CLEANING AND INSPECTION

Refer to Part 8-1, Section 3 for the cleaning and inspection procedures.

PISTONS AND CONNECTING RODS

REMOVAL

1. Drain the cooling system and the crankcase.

2. Refer to Cylinder Head Removal and remove the cylinder head and related parts.

3. Remove the oil pan and related parts. Remove the oil pump inlet tube and the oil pump.

4. Turn the crankshaft until the piston to be removed is at the bottom of its travel and place a cloth on the piston head to collect the cuttings. Remove any ridge and/or deposits from the upper end of the cylinder bores. Remove the cylinder ridge with a ridge cutter. Follow the instructions furnished by the tool manufacturer. **Never cut into the ring travel area in excess of 1/32 inch when removing ridges.**

5. Make sure all the connecting rod caps are marked so that they can be installed in their original positions. Remove the connecting rod cap.

6. Push the connecting rod and piston assembly out the top of the cylinder with the handle end of a hammer. Avoid damage to the crankpin or the cylinder wall when removing the piston and rod.

INSTALLATION

1. Clean the oil pump inlet tube screen, and the oil pan and block gasket surfaces.

2. Oil the piston rings, pistons and cylinder walls with light engine oil.

3. Be sure to install the pistons in the same cylinders from which they were removed, or to which they were fitted. The connecting rod and bearing caps are numbered from 1 to 6 beginning at the front of the engine. The numbers on the connecting rod and bearing cap must be on the same side when installed in the cylinder bore. If a connecting rod is ever transposed from one block or cylinder to another, new bearings should be fitted and the connecting rod should be numbered to correspond with the new cylinder.

4. Make sure the ring gaps are properly spaced around the circumference of the piston (Fig. 43). Install a piston ring compressor on the piston and push the piston in with a hammer handle until it is slightly below the top of the cylinder (Fig. 44). Be sure to guide the connecting rods to avoid damaging the crankshaft journals. **Install the piston with the notch in the piston head toward the front of the engine.**

5. Check the clearance of each bearing following the procedure under Connecting Rod Bearing Replacement.

6. After the bearings have been fitted, apply a light coat of engine oil to the journals and bearings.

7. Turn the crankshaft throw to the bottom of its stroke, then push the piston all the way down until the connecting rod bearing seats on the crankshaft journal. Install the connecting rod cap. Torque the nuts to specifications.

8. After the piston and connecting rod assemblies have been installed, check the connecting rod side clearance on each crankshaft journal (Fig. 45).

9. Prime the oil pump by filling the inlet opening with oil and rotating the pump shaft until oil emerges from the outlet opening. Install the oil pump and the oil pump inlet tube. Install the oil pan and related parts.

10. Install cylinder head by following steps 1 through 18 under Cylinder Head Installation.

11. Fill the crankcase.

12. Start the engine and check for oil pressure. Operate the engine at fast idle and check for oil and coolant leaks.

13. Check and adjust the ignition timing, engine idle speed and the fuel mixture.

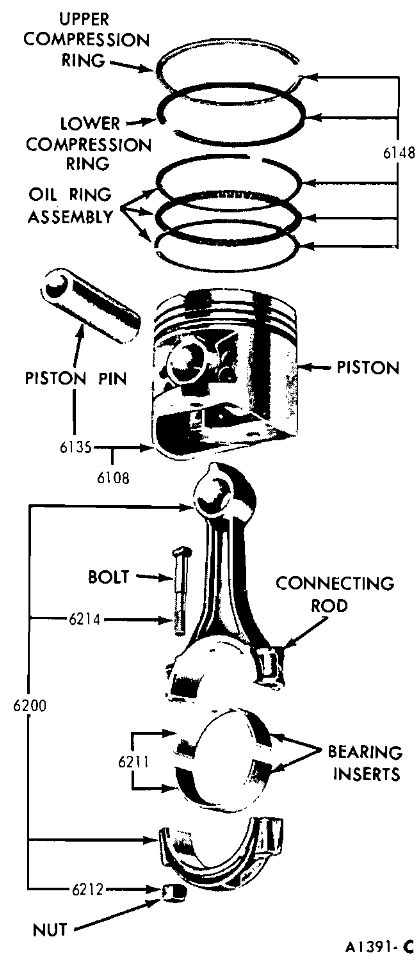


FIG. 47—Typical Piston, Connecting Rod and Related Parts

14. Install the air cleaner.

DISASSEMBLY

1. Remove the bearing inserts from the connecting rod and cap.
2. Mark the pistons and pins to assure assembly with the same rod and installation in the same cylinders from which they were removed.
3. Using an Arbor Press and the tool shown in Fig. 46, press the piston pin from the piston and connecting rod. Remove the piston rings.

CLEANING AND INSPECTION

Refer to Part 8-1, Section 3 for the cleaning and inspection procedures.

REPAIRS

To fit new pistons, pins or rings, refer to Part 8-1, Section 2.

ASSEMBLY

The piston, connecting rod and related parts are shown in Fig. 47. **Check the fit of a new piston in the**

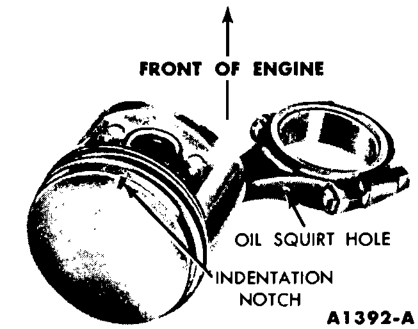


FIG. 48—Typical Piston and Connecting Rod Assembly

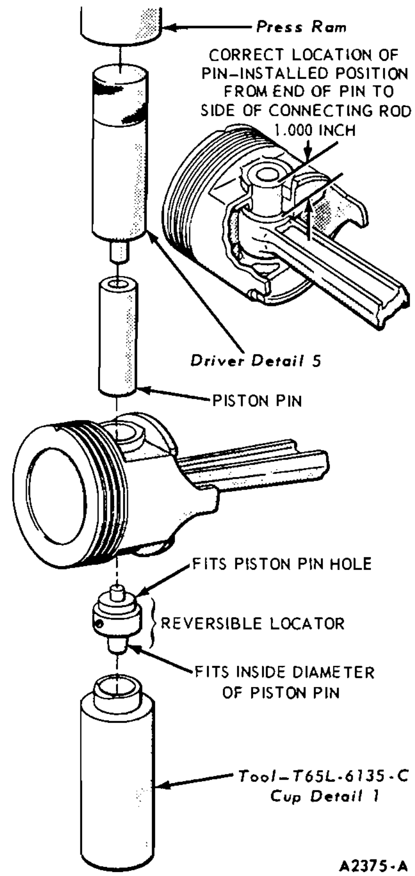


FIG. 49—Piston Pin Installation

cylinder bore before assembling the piston and piston pin to the connecting rod.

The piston pin bore of a connecting rod and the diameter of the piston pin must be within specifications. Refer to Part 8-5.

1. Apply a light coat of engine oil to all parts. **Assemble the piston to the connecting rod with the oil squirt hole in the connecting rod and the indentation in the piston positioned as shown in Fig. 48.**
2. Start the piston pin in the piston and connecting rod. Using an arbor press, press the piston pin through the piston and connecting rod until the end of the pin is 1.000 inch from the side of the connecting rod (Fig. 49).
3. Check the end gap of all piston rings (Part 8-1). They must be within specifications.
4. Follow the manufacturer's instructions (included with the piston ring package) and install the piston rings.
5. Check the ring side clearance of the compression rings with a feeler gauge inserted between the ring and its lower land (Part 8-1, Section 2). The gauge should slide freely around the entire ring circumference without binding. Any wear that occurs will form a step at the inner portion of the lower land. **If the lower lands have high steps, the piston should be replaced.**
6. Be sure the bearing inserts and the bearing bore in the connecting rod and cap are clean. Foreign material under the inserts will distort the bearing and cause a failure. Install the bearing inserts in the connecting rod and cap with the tangs fittings in the slots provided.

FLYWHEEL

REMOVAL

1. On a manual-shift transmission, remove the transmission, clutch pressure plate and disc, following the procedures in Group 5. Do not drain the transmission.

On a vehicle with automatic transmission, remove the transmission and converter housing following the procedure in Group 7. Do not drain the transmission.

2. Remove the flywheel retaining bolts and remove the flywheel.

CLEANING AND INSPECTION

Refer to Part 8-1, Section 3 for the cleaning and inspection procedures.

REPAIRS

To check flywheel face runout, refer to Part 8-1, Section 1.

INSTALLATION

1. Position the flywheel on the crankshaft flange. Apply oil-resistant sealer to the retaining bolts. Install and torque the bolts in sequence across from each other to specifications.
2. On a manual-shift transmission, install the clutch pressure plate, disc, and the transmission following the

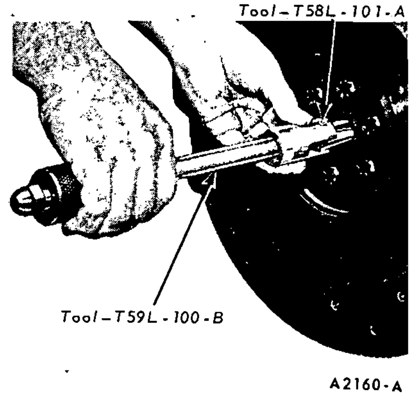


FIG. 50—Typical Clutch Pilot Bushing Removal

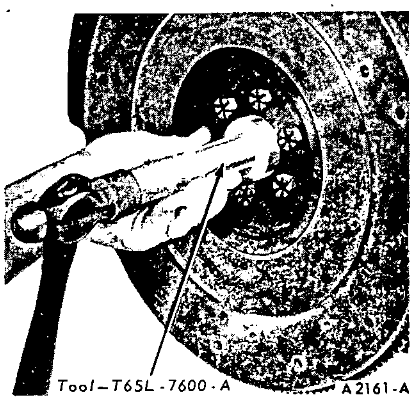


FIG. 51—Typical Clutch Pilot Service Bearing Installation

procedures in Group 5.

On a vehicle with automatic transmission, install the converter housing and transmission following the procedure in Group 7. It is not necessary to adjust the transmission, when it has been removed only for flywheel removal.

CLUTCH PILOT BUSHING REPLACEMENT

Inspection procedures are outlined under Flywheel Cleaning and Inspection in Part 8-1, Section 3.

1. Remove the transmission, clutch pressure plate, and disc following the procedures in Group 5.

2. Using tools T59L-100-B and T58L-101-A, remove the pilot bushing (Fig. 50).

3. Coat the pilot bushing bore in the crankshaft with a small quantity of wheel bearing lubricant. **Avoid using too much lubricant as it may be thrown onto the clutch disc when**

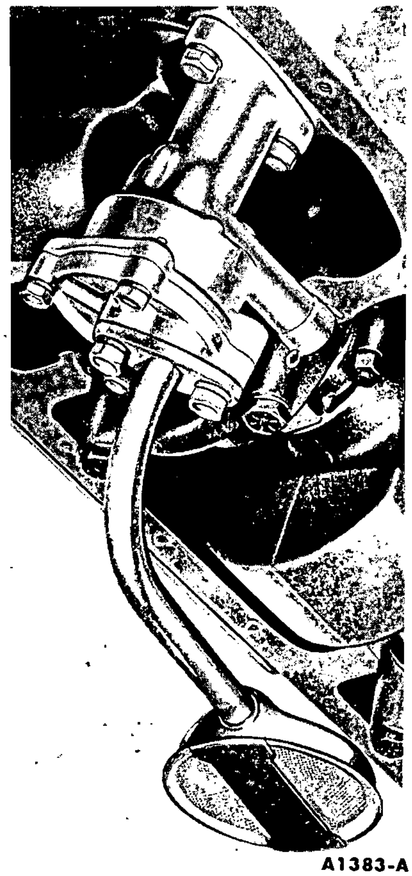


FIG. 52—170 Six Oil Pump Inlet Tube Installed

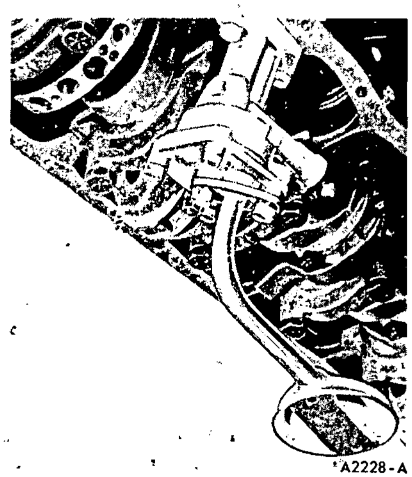


FIG. 53—200 Six Oil Pump Inlet Tube Installed

the clutch revolves.

4. Using tool T52T-12175-AJD, install the pilot service bearing (Fig. 51).

5. Install the clutch pressure plate, disc, and the transmission following the procedures in Group 5.

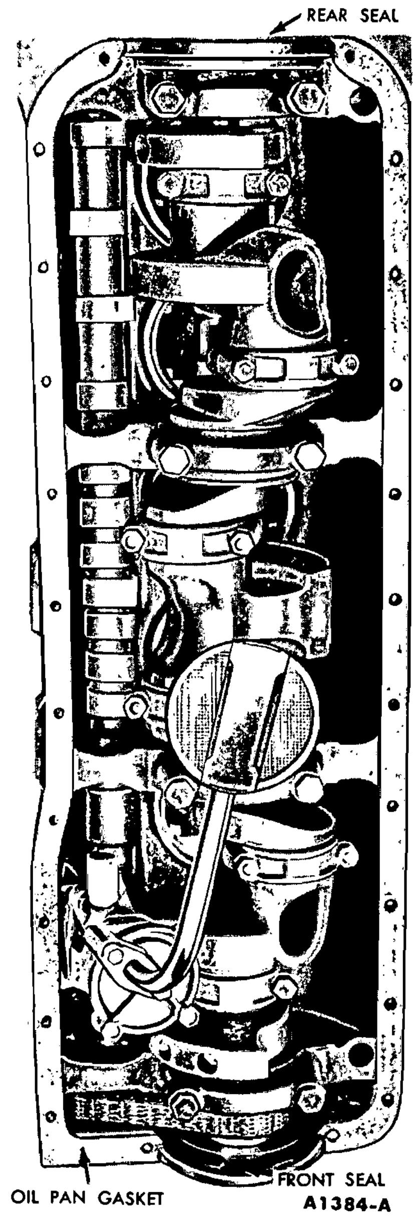


FIG. 54—170 Six Oil Pan Gaskets and Seals Installed

OIL FILTER REPLACEMENT

1. Place a drip pan under the filter. Unscrew the filter from the adapter fitting. Clean the adapter filter recess.

2. Coat the gasket on the replacement filter with oil. Position the filter on the adapter fitting. Hand tighten the filter until the gasket contacts the adapter face, then advance it 1/2 turn.

3. Operate the engine at fast idle, and check for oil leaks. If oil leaks are evident, perform the necessary repairs to correct the leakage. Check the oil level and fill the crankcase if necessary.

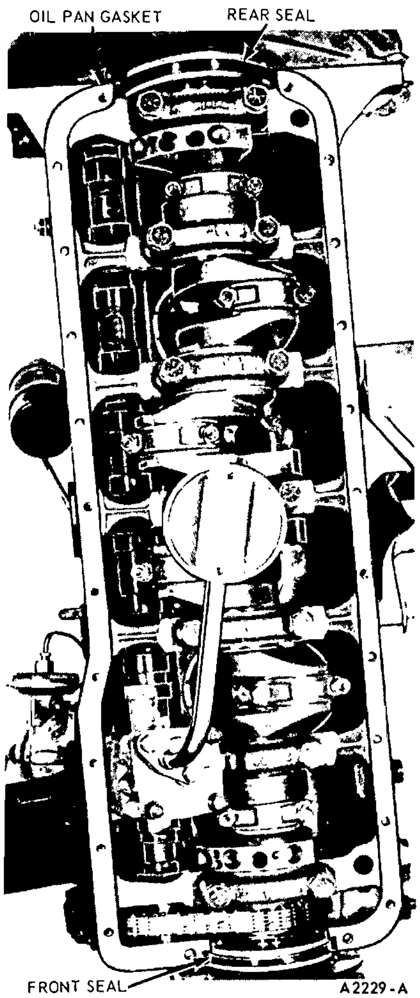


FIG. 55—200 Six Oil Pan Gaskets and Seals Installed

OIL PAN

REMOVAL

1. Drain the crankcase.
2. Remove the oil level dipstick and the flywheel housing inspection cover.
3. On a Mustang, disconnect the stabilizer bar and pull it downward out of the way. Remove one bolt and loosen the other on the No. 2 crossmember and lower it out of the way.
4. Remove the oil pan and gasket.
5. Remove the oil pump inlet tube and screen assembly.

CLEANING AND INSPECTION

Refer to Part 8-1, Section 3 for the cleaning and inspection procedures.

INSTALLATION

1. Clean and install the oil pump inlet tube and screen assembly (Fig. 52 or 53).
2. Clean the gasket surfaces of the block and oil pan. Be sure to clean the seal retainer grooves in the cylinder block and oil pan. The oil pan has a two-piece gasket. Coat the block surface and the oil pan gasket surface with oil-resistant sealer. Position the oil pan gaskets on the cylinder block (Fig. 54 or 55).
3. Position the oil pan front seal on the cylinder front cover (Fig. 52 or 53). **Be sure the tabs on the seal are over the oil pan gasket.**
4. Position the oil pan rear seal on the rear main bearing cap (Fig. 54 or 55). **Be sure the tabs on the seal are over the oil pan gasket.**
5. Hold the oil pan in place against the block and install a bolt, finger-tight, on each side of the oil pan. Install the remaining bolts. Torque the bolts from the center outward in each direction to specifications.
6. On a Mustang, position the No. 2 crossmember and torque the bolts to specification. Position the stabilizer bar to the chassis and install the bolts and nuts. Torque to specifications.
7. Install the oil level dipstick. Fill the crankcase with the proper grade and quantity of engine oil. Operate the engine and check for oil leaks.

OIL PUMP

REMOVAL

1. Remove the oil pan and related parts as outlined under oil Pan Removal.
2. Remove the oil pump retaining bolts and remove the oil pump, gasket, and intermediate drive shaft.

INSTALLATION

1. Prime the oil pump by filling either the inlet or outlet port with engine oil. Rotate the pump shaft to distribute the oil within the pump body.
2. Position the intermediate drive shaft into the distributor socket.
3. Position a new gasket on the pump housing. Insert the intermediate drive shaft into the oil pump. Install the pump and shaft as an assembly. **Do not attempt to force the pump into position if it will not seat readily. The drive shaft hex may be misaligned with the distributor shaft. To align, rotate the intermediate drive shaft into a new position.** Torque the oil pump retaining screws to specifications.
4. Install the oil pan and related parts as outlined under Oil Pan Installation.

DISASSEMBLY

1. Remove the oil inlet tube from the oil pump and remove the gasket.
2. Remove the cover retaining screws, and remove the cover. Remove the inner rotor and shaft assembly, and remove the outer race.
3. Insert a self-threading sheet metal screw of the proper diameter into the oil pressure relief valve chamber cap and pull the cap out of the chamber. Remove the spring and plunger.

CLEANING AND INSPECTION

Refer to Part 8-1, Section 3 for the cleaning and inspection procedures.

ASSEMBLY

The oil pump assembly is shown in Fig. 56.

1. Oil all parts thoroughly.
2. Install the oil pressure relief valve plunger, spring, and a new cap.
3. Install the outer race, and the inner rotor and shaft assembly. **Be sure the identification mark on the rotor and on the outer race both face to the bottom of the pump. The inner rotor and shaft, and the outer race are serviced as an assembly. One part should not be replaced without replacing the other.** Install the cover and torque the cover retaining screws to specifications.
4. Position a new gasket and the oil inlet tube on the oil pump and install the retaining bolts.

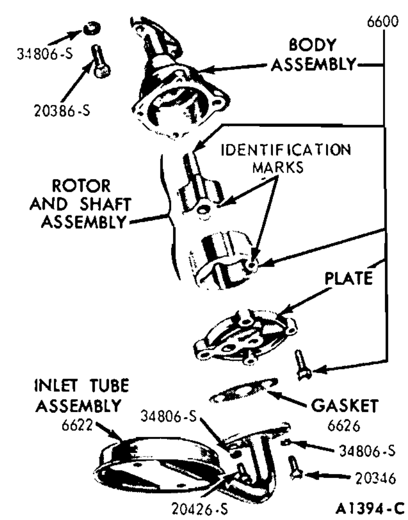


FIG. 56—Typical Oil Pump Assembly

[3] ENGINE REMOVAL AND INSTALLATION

REMOVAL

1. Remove the hood.

2. Drain the cooling system and the crankcase.

3. Remove the air cleaner. Disconnect the battery ground cable at the cylinder head, and at the battery. Disconnect the radiator upper hose at the water outlet housing and the radiator lower hose at the water pump. On a vehicle with automatic transmission disconnect the transmission oil cooler lines from the radiator.

4. Remove the oil slinger. Check the drive belt, fan, and pulley.

5. Disconnect the heater hoses from the water pump and the carburetor spacer. Disconnect the alternator wires from the alternator, the starter cable from the starter, the accelerator rod and the choke control cable from the carburetor. On a vehicle with air conditioning, remove the compressor from the mounting bracket, and position it out of the way, **leaving the refrigerant lines attached.**

6. Disconnect the flexible fuel line at the fuel tank line and plug the fuel tank line.

7. Disconnect the coil primary wire at the coil. Disconnect the oil pressure and the water temperature sending unit wires at the sending units. On a vehicle with intermittent windshield wipers, disconnect the vacuum hose from the engine fitting.

8. Remove the starter and dust seal.

On a vehicle with a manual-shift transmission, disconnect the clutch retracting spring. Disconnect the clutch equalizer shaft and arm bracket at the underbody rail and remove the arm bracket and equalizer shaft.

9. Raise the vehicle. Remove the flywheel or converter housing upper retaining bolts through the access holes in the underbody.

10. Disconnect the muffler inlet pipe at the exhaust manifold. Loosen the inlet pipe clamp and slide it off the support bracket on the engine. Disconnect the engine right and left mount at the underbody bracket. Remove the flywheel or converter housing cover.

On a vehicle with a manual-shift transmission, remove the flywheel housing lower retaining bolts.

On a vehicle with automatic transmission, disconnect the converter from the flywheel. Remove the converter housing lower retaining bolts.

11. Lower the vehicle. Support the transmission and flywheel or converter housing with a jack.

12. Attach the engine lifting hook (Fig. 57). Carefully lift the engine out of the engine compartment. Install the engine on a work stand (Fig. 58).

INSTALLATION

1. Install guide pins in the flywheel or converter housing bolt holes in the rear of the engine. Place a new gasket over the studs of the exhaust manifold.

2. Carefully lower the engine into the engine compartment.

3. Make sure the studs on the exhaust manifold are aligned with the holes in the muffler inlet pipe and the guide pins in the block engage the holes in the flywheel housing.

On a vehicle with automatic transmission, start the converter pilot into the crankshaft.

On a vehicle with a manual-shift transmission, start the transmission main drive gear into the clutch disc. It may be necessary to adjust the position of the transmission in relation to the engine if the input shaft will not enter the clutch disc. **If the engine hangs up after the shaft enters, turn the crankshaft slowly (transmission in gear) until the shaft splines mesh with the clutch disc splines.**

4. Remove the engine lifting hooks. Install the flywheel or converter housing upper retaining bolts.

5. Remove the jack from the transmission. Raise the vehicle.

6. Remove the guide pin and install the flywheel or converter housing lower retaining bolts.

On a vehicle with automatic transmission, attach the converter to the flywheel and torque the retaining nuts to specifications.

7. Install the flywheel or converter housing dust cover.

On a vehicle with a manual-shift transmission, install the clutch equalizer shaft and arm bracket. Connect the clutch retracting spring.

8. Install the engine left and right mount to the underbody bracket. Install the sediment bowl on the fuel pump.

9. Remove the plug from the fuel tank line and connect the flexible fuel line to the fuel tank line. Install the exhaust manifold to muffler inlet pipe retaining lock washers and nuts. Torque the nuts to specifications. Position the inlet pipe clamp on the support bracket on the engine and tighten the clamp.

10. Lower the vehicle. Connect the oil pressure and the engine temperature sending unit wires. Connect the coil primary wire. Connect the windshield wiper vacuum hose to the engine fitting. Connect the accelerator rod. Connect and adjust the choke control cable.

11. Install the starter motor and dust seal. Connect the starter cable. Connect the alternator wires. Connect the heater hose at the water pump and carburetor spacer. Connect the battery ground cable.

12. Install the pulley, fan, and drive belt. Adjust the drive belt tension. On a vehicle with air conditioning, install the compressor on the mounting bracket, and adjust the belt tension to specifications. Install the radiator. Connect the radiator upper and lower hoses. Fill and bleed the cooling system. Fill the crankcase with the proper grade and quantity of engine oil.

13. Install and adjust the hood.

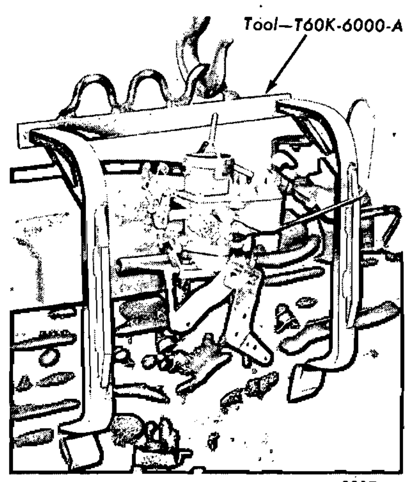


FIG. 57—Engine Lifting Hook

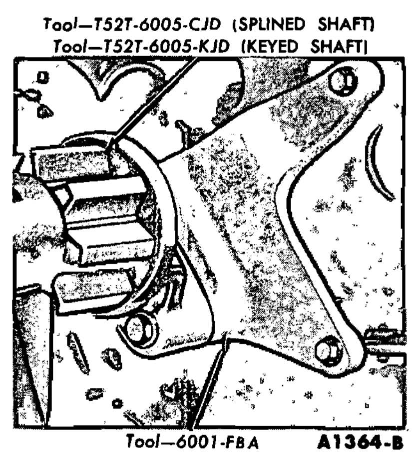


FIG. 58—Engine Work Stand

14. Operate the engine at fast idle and check all gaskets and hose connections for leaks.

On a vehicle with automatic transmission, adjust the transmission control linkage (Group 7).

15. Install the air cleaner.

4 MAJOR REPAIR OPERATIONS

To perform the operations in this section, it will be necessary to remove the engine from the vehicle and install it on a work stand.

When installing nuts or bolts that must be torqued (refer to Part 8-5 for torque specifications), oil the threads with light weight engine oil. **Do not oil threads that require oil-resistant or water-resistant sealer.**

CRANKSHAFT

REMOVAL

The crankshaft and related parts are shown in Fig. 59 or 60.

1. Loosen the alternator adjusting bolts and remove the fan belt. Remove the oil level dipstick.

2. Remove the accessory drive pulley (if so equipped). Remove the crankshaft damper retaining bolt and washer. Remove the crankshaft vibration damper using tool T58P-6316-A.

3. Remove the cylinder front cover and air conditioning idler pulley assembly (if so equipped). Remove the cover gasket.

4. Remove the oil slinger. Check the timing chain deflection; then remove the timing chain and sprockets by following steps 4 and 5 under Cylinder Front Cover and Timing Chain Removal.

5. Invert the engine on the work stand. Remove the flywheel. Remove the oil pan and gasket. Remove the oil pump.

6. Make sure all bearing caps (main and connecting rod) are marked so that they can be installed in their original locations. Turn the crankshaft until the connecting rod from which the cap is being removed is down. Remove the connecting rod cap. Push the connecting rod and piston assembly up in the cylinder. Repeat for the remaining caps.

7. Remove the main bearing caps.

8. Carefully lift the crankshaft out of the block so that the thrust bearing surfaces are not damaged. **Handle the crankshaft with care to avoid possible fracture or damage to the finished surfaces.**

CLEANING AND INSPECTION

Refer to Part 8-1, Section 3, for the cleaning and inspection procedures. **Be sure the oil seal surfaces on the crankshaft and crankshaft damper are properly cleaned.**

REPAIRS

To refinish journals, dress minor imperfections, etc., refer to Part 8-1, Section 2.

INSTALLATION

1. Remove the rear journal oil seal from the block and rear main bearing cap.

2. Remove the main bearing inserts from the block and bearing caps.

3. Remove the connecting rod bearing inserts from the connecting rods and caps.

4. Clean the rear journal oil seal grooves. Install a new rear journal oil seal in the block (Fig. 61) and rear main bearing cap (Fig. 41). After installation, cut the ends of the seals flush.

5. Apply a thin coating of oil resistant sealer to the rear main bearing cap at the rear of the top mating surface (Fig. 41). **Do not apply sealer to the area forward of the oil slinger groove.**

6. If the crankshaft main bearing journals have been refinished to a definite undersize, install the correct undersize bearings. Be sure the bearing inserts and bearing bores are clean. Foreign material under the inserts will distort the bearing and cause a failure.

7. Place the upper main bearing inserts in position in the bores with the tang fitting in the slot provided.

8. Install the lower main bearing inserts in the bearing caps.

9. Carefully lower the crankshaft into place. **Be careful not to damage the bearing surfaces.**

10. Check the clearance of each main bearing. Place a piece of Plastigage on the crankshaft journal the full width of the journal and about 1/4 inch off center (Fig. 62). Follow steps 11 thru 13 under Main Bearing Replacement.

11. After the bearings have been fitted, apply a light coat of engine oil to the journals and bearings. Install all the bearing caps, except the thrust bearing cap (No. 3 bearing on a 170 Six engine or No. 5 bearing on a 200 Six engine). **Be sure that the main bearing caps are installed in their original locations.** Torque the bearing cap bolts to specifications.

12. Install the thrust bearing cap with the bolts finger-tight.

13. Pry the crankshaft forward against the thrust surface of the upper half of the bearing (Fig. 42).

14. Hold the crankshaft forward and pry the thrust bearing cap to the rear (Fig. 42). This will align the

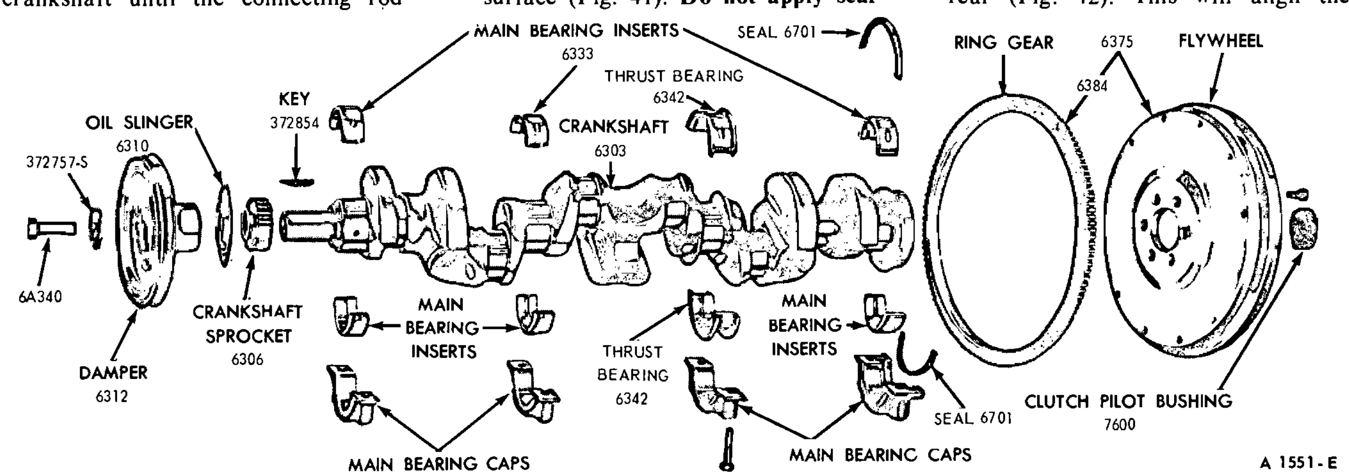


FIG. 59—Typical 170 Six Crankshaft and Related Parts

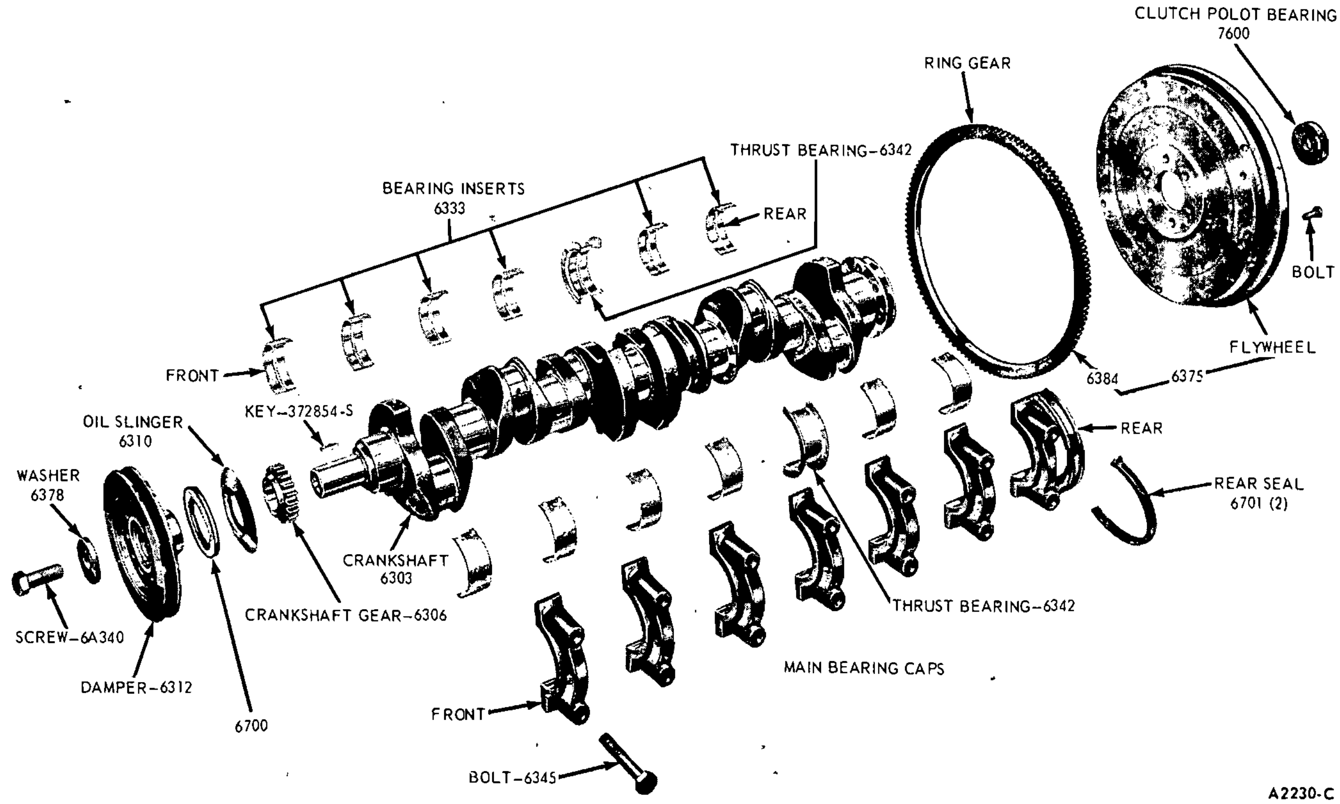


FIG. 60—Typical 200 Six Crankshaft and Related Parts

thrust surfaces of both halves of the bearing.

15. Retain the forward pressure on the crankshaft. Torque the cap bolts to specifications (Fig. 42).

16. Force the crankshaft toward the rear of the engine.

17. Install a dial indicator so that the contact point rests against the crankshaft flange and the indicator axis is parallel to the crankshaft axis (Fig. 63).

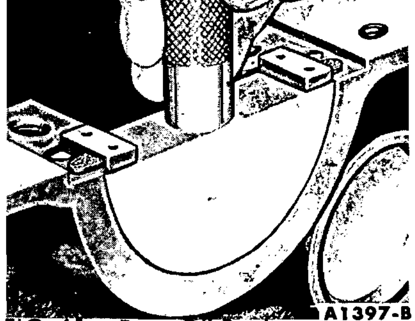


FIG. 61—Rear Oil Seal to Block Installation

18. Zero the dial indicator. Push the crankshaft forward and note the reading on the dial.

19. If the end play exceeds specifications, replace the thrust bearing. If the end play is less than the minimum limit, inspect the thrust bearing faces for scratches, burrs, nicks, or dirt. If the thrust faces are not defective or dirty, they probably were not aligned properly. Install the thrust bearing and align the faces following the recommended procedure (steps 12, 13, 14, and 15). Check the end play which should be within specifications.

20. Install new bearing inserts in the connecting rods and caps. Check the clearance of each bearing following the procedure under Connecting Rod Bearing Replacement.

21. If the bearing clearances are to specifications, apply a light

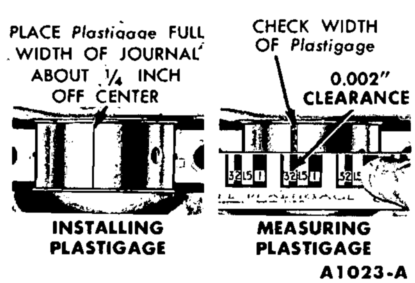


FIG. 62—Installing and Measuring Plastigage—Engine on Work Stand

coat of engine oil to the journals and bearings.

22. Turn the crankshaft throw to the bottom of its stroke. Push the piston all the way down until the rod bearing seats on the crankshaft journal.

23. Install the connecting rod cap. Torque the nuts to specifications.

24. After the piston and connecting rod assemblies have been installed, check the connecting rod side clearance on each connecting rod crankshaft journal (Fig. 45).

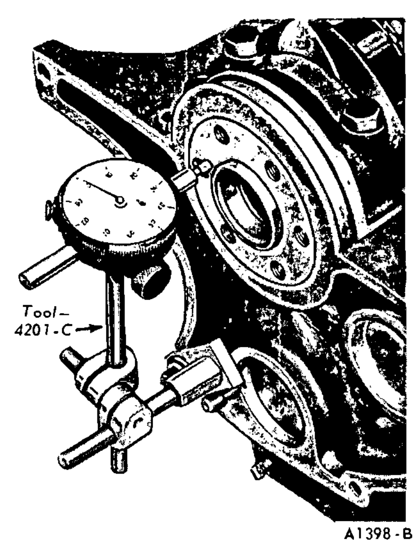


FIG. 63—Crankshaft End Play

25. Turn the engine on the work stand so that the front end is up. Install the timing chain and sprockets, cylinder front cover and crankshaft pulley or damper, following steps 1 thru 3 under Cylinder Front Cover and Timing Chain Installation.

26. Clean the oil pan, oil pump, and oil pump screen.

27. Prime the oil pump by filling the inlet opening with oil and rotating the pump shaft until oil emerges from the outlet opening. Install the oil pump following steps 1, 2, and 3 under Oil Pump Installation. Install the oil pan following steps 2 thru 5 under Oil Pan Installation.

28. Position the flywheel on the crankshaft. Apply oil-resistant sealer to the flywheel retaining bolts. Install and torque the retaining bolts to specifications.

On a flywheel for a manual-shift transmission, use tool 7563 to locate the clutch disc. Install the pressure plate.

29. Turn the engine on the work stand so that the engine is in the normal position. Install the oil level dipstick. Install and adjust the drive belt.

30. Remove the engine from the work stand and install it in the vehicle.

CAMSHAFT BEARING REPLACEMENT

The camshaft bearings are available pre-finished to size and require no reaming for standard and 0.015-inch undersize journal diameters.

1. Remove the flywheel and the camshaft. Remove the rear bearing bore plug (Fig. 37).

2. Remove the camshaft bearings with the tool shown in Fig. 64.

3. Select the proper size expanding collet and back-up nut and assemble on the expanding mandrel. With the expanding collet collapsed, install the collet assembly in the camshaft bearing, and tighten the back-up nut on the expanding mandrel until the collet fits the camshaft bearing.

4. Assemble the puller screw and extension (if necessary) as shown and install on the expanding mandrel. Wrap a cloth around the threads of the puller screw to protect the front bearing or journal. Tighten the pulling nut against the thrust bearing and pulling plate to remove the camshaft bearing. Be sure to hold a wrench on the end of the puller screw to prevent it from turning.

5. Repeat the procedure for each bearing. To remove the front bearing, install the puller screw from the rear of the cylinder block.

6. Position the new bearings at the bearing bores, and press them in place with the tool shown in Fig. 64. Be sure to center the pulling plate and puller screw to avoid damage to the bearing. **Failure to use the correct expanding collet can cause severe bearing damage.** Align the oil holes in the bearings with the oil holes in the cylinder block when the bearings are installed. **Be sure the front bearing is installed below the front face of the cylinder block to specifications. The rear has two oil holes and must be installed 24 3/4 inches from the face of the camshaft thrust plate surface.** Check the oil passage that feeds the rocker arm shaft for obstructions by squirting oil into the opening in the cylinder block and observing the flow through the oil hole at the rear camshaft bearing.

7. Clean out the camshaft rear bearing bore plug recess thoroughly. Coat the flange of a new plug with oil-resistant sealer and install the plug (Fig. 38) with the flange edge of the plug facing outward.

8. Install the camshaft, crankshaft, flywheel and related parts, following the appropriate procedures in Part 8-2, Section 2 or Section 4, except do not check connecting rod and main bearing clearances as a part of Camshaft Bearing Replacement. Install the engine in the vehicle.

CYLINDER ASSEMBLY REPLACEMENT

DISASSEMBLY

Follow steps 1 thru 3, 5 thru 13, and 24 under Engine Disassembly. Remove the cylinder assembly from the work stand.

CLEANING

Clean the gasket and seal surfaces of all parts and assemblies (refer to Part 8-1, Section 3).

ASSEMBLY

Install the replacement cylinder block assembly on a work stand. Transfer all parts removed from the old cylinder assembly to the new cylinder assembly, following the procedures in steps 28 thru 44, 47 thru 50, 53 and 56 thru 58 under Engine Assembly. Check all assembly clearances.

CYLINDER BLOCK REPLACEMENT

DISASSEMBLY

Follow steps 1 thru 3, 5 thru 19, 21 and 24 under Engine Disassembly. Remove the cylinder assembly from the work stand.

CLEANING

Clean the gasket and seal surfaces of all parts and assemblies (refer to Part 8-1, Section 3).

ASSEMBLY

Install the replacement cylinder block assembly on a work stand. Transfer all parts removed from the old cylinder assembly to the new cylinder assembly, following the procedures in steps 1 thru 4, 6 thru 9, 11 thru 21, 28 thru 50, 53 and 56 thru 58 under Engine Assembly. Check all assembly clearances.

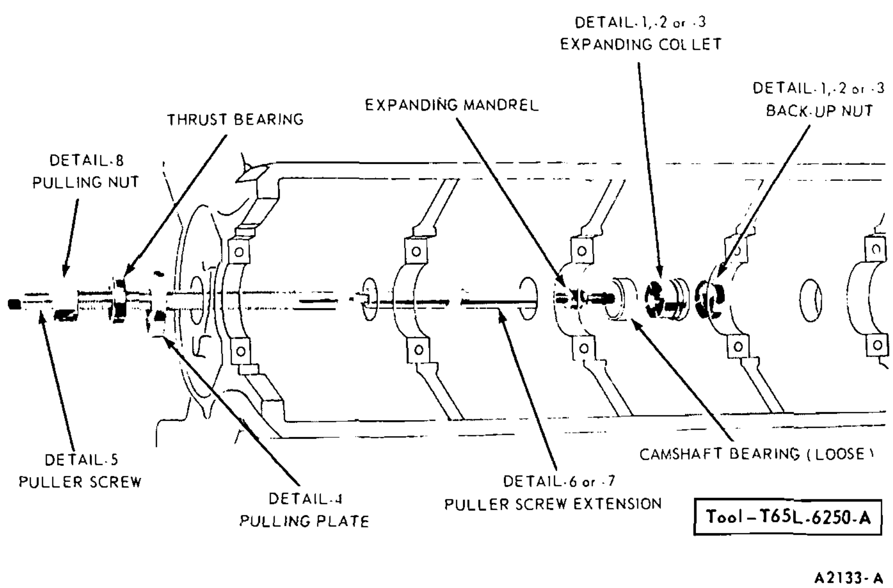


FIG. 64—Typical Camshaft Bearing Replacement

ENGINE DISASSEMBLY

1. Disconnect the distributor vacuum line at the carburetor.

2. Disconnect the carburetor fuel inlet line at the fuel filter, and at the fuel pump. Disconnect the distributor vacuum line at the distributor. Remove the fuel inlet line and distributor vacuum line as an assembly.

3. Remove the crankcase ventilation system by following the procedures under Crankcase Ventilation System Removal in Section 2 of this part of the manual.

On a vehicle with Thermactor exhaust emission control system, disconnect the air and vacuum lines. Remove the air supply pump, air manifold assembly, air pump, air cleaner assembly, backfire suppressor valve, and air and vacuum lines and brackets.

4. Remove the automatic choke heat tube; then remove the carburetor and gasket. Remove the exhaust manifold.

5. Remove the coil. Remove the distributor cap and spark plug wires as an assembly. Remove the distributor, fuel pump, oil pressure sending unit, oil filter and oil filter mounting insert. Remove the spark plugs.

6. Remove the valve rocker arm cover. Remove the valve rocker arm shaft assembly (Fig. 21) by removing the support bolts evenly and equally 2 turns at a time.

7. Remove the valve push rods in sequence and identify them so that they can be installed in their original positions (Fig. 22).

8. Remove all cylinder head bolts. Lift the cylinder head assembly off the engine. **Do not pry between the head and block as the gasket surfaces may become damaged.** Using a magnet, remove the valve lifters and keep them in order so they can be installed in their original location (Fig. 34).

On a flywheel for a manual-shift transmission, mark the pressure plate cover so that it can be replaced in the same position. Remove the clutch pressure plate and cover assembly.

Remove the flywheel. Remove the clutch pilot bushing (Fig. 50) and engine rear cover plate.

9. Remove the dipstick and the oil pan. Discard the gasket and seals.

10. Remove the oil pump and inlet tube assembly. Discard the oil pump gasket.

11. Loosen the alternator mounting bolts and disconnect the alternator adjusting arm at the water pump. Remove the drive belt.

12. Remove the alternator, the water pump and the accessory drive pulley (if so equipped). Remove the crankshaft damper. Remove the damper by using tool T58P-6316-A.

13. Remove the cylinder front cover. Discard the gasket. Remove the crankshaft front oil slinger. Check the camshaft end play by following step 15 under Camshaft Removal. Check timing chain deflection by following step 4 under Cylinder Front Cover Removal.

14. Remove the camshaft sprocket retaining bolt and washer. Slide both sprockets and the timing chain forward and remove them as an assembly (Fig. 31).

15. Remove any ridges and/or deposits from the upper end of the cylinder bores. Remove the cylinder ridges with a ridge cutter. Follow the instructions furnished by the tool manufacturer. **Never cut into the ring travel area in excess of 1/32 inch when removing ridges.**

16. Make sure all bearing caps (main and connecting rod) are marked so they can be installed in their original locations. Turn the crankshaft until the connecting rod being removed is down. Remove the connecting rod cap.

17. Push the connecting rod and piston assembly out the top of the cylinder with the handle end of a hammer. **Avoid damage to the crankpin or the cylinder wall when removing the piston and rod.**

18. Remove the bearing inserts from the connecting rods and caps. Remove the main bearing caps.

19. Carefully lift the crankshaft out of the cylinder block so that the thrust bearing surfaces are not damaged. **Handle the crankshaft with care to avoid possible fracture or damage to the finished surfaces.**

20. Remove the rear journal oil seal from the block and rear main bearing cap. Remove the main bearing inserts from the block and bearing caps.

21. Remove the camshaft thrust plate. Carefully remove the camshaft by pulling it toward the front of the engine. **Use caution to avoid damaging the journals and lobes.**

22. Remove the camshaft rear bearing bore plug (Fig. 37).

23. Remove the camshaft bearings (Fig. 64).

24. Remove the dipstick tube and the plug or drain.

ENGINE ASSEMBLY

1. Install the camshaft bearings and rear bore plug by following steps 6 and 7 under Camshaft Bearing Replacement.

2. The camshaft and related parts are shown in Fig. 34. Oil the camshaft journals and apply Lubriplate to all camshaft lobes. Carefully slide the camshaft through the bearings.

3. Install the thrust plate. Torque the retaining screws to specifications.

4. The crankshaft and related parts are shown in Fig. 59 or 60. Be sure that the rear journal oil seal grooves are clean. Install a new rear journal oil seal in the block (Fig. 61) and rear main bearing cap (Fig. 41). After installation, but the ends of the seals flush.

5. If the crankshaft main bearing journals have been refinished to a definite undersize, install the correct undersize bearings. Be sure the bearing bores are clean. Place the upper main bearing inserts in position in the bore with the tang fitting in the slot provided.

6. Install the lower main bearing inserts in the bearing caps.

7. Carefully lower the crankshaft into place. **Be careful not to damage the bearing surfaces.**

8. Check the clearance of each main bearing following steps 10 thru 13 under Main Bearing Replacement. In step 10, place the Plastigage on the crankshaft journal instead of in the bearing cap (Fig. 62).

9. After the bearings have been fitted, apply a light coat of engine oil to the journals and bearings. Install all the bearing caps, except the thrust bearing cap (No. 3 bearing on 170 six engine or No. 5 bearing on 200 six engine). **Be sure that the main bearing caps are installed in their original locations.** Torque the bearing cap bolts to specifications.

10. Install the thrust bearing cap by following steps 12 thru 15 under Crankshaft Installation.

11. Check the crankshaft end play by following steps 17 thru 19 under Crankshaft Installation.

12. Turn the engine on the work stand so that the front end is up.

13. Oil the piston rings, pistons, and cylinder walls with light engine oil.

14. Be sure to install the pistons in the same cylinders from which they were removed, or to which they were fitted. The connecting rod and bearing cap are numbered from 1 to 6 beginning at the front of the engine. The numbers on the connecting rod and bearing cap must be on the same side when installed in the cylinder bore. If a connecting rod is ever transposed from one block or cylinder to another, new bearings should be fitted and the connecting rod should be numbered

to correspond with the new cylinder number.

15. Make sure the ring gaps are properly spaced around the circumference of the piston.

16. Install a piston ring compressor on the piston and push the piston in with a hammer handle until it is slightly below the top of the cylinder (Fig. 44). Be sure to guide the connecting rods to avoid damaging the crankshaft journals. **Install the piston with the notch in the piston head toward the front of the engine.**

17. Check the clearance of each bearing following the precedure under Connecting Rod Bearing Replacement.

18. After the bearings have been fitted, apply a light coat of engine oil to the journals and bearings.

19. Turn the crankshaft throw to the bottom of its stroke. Push the piston all the way down until the connecting rod bearing seats on the crankshaft journal.

20. Install the connecting rod cap. Torque the nuts to specifications.

21. After the piston and connecting rod assemblies have been installed, check the connecting rod side clearance on each crankshaft journal (Fig. 45).

22. Lubricate the timing chain and sprockets with engine oil. Place the keys in position in the slots on the crankshaft and camshaft.

23. Oil the timing chain. Position the sprockets and timing chain on the camshaft and crankshaft. Be sure the timing marks on the sprockets and chain are positioned as shown in Fig. 30.

24. Install the camshaft sprocket retaining bolt and washer. Torque the bolt to specifications. Check the camshaft end-play (Fig. 36). Install the oil slinger.

25. Clean the cylinder front cover and the gasket surface of the cylinder block.

26. Install a new crankshaft front oil seal.

27. Coat the gasket surface of the block and the cover with oil-resistant sealer. Position a new gasket on the block.

28. Using tool T61K-6019-A, install the cylinder front cover on the block. Torque the screws to specifications. Apply Lubriplate to the seal surface, and to the seal running surface of the damper.

29. Line up the crankshaft damper keyway with the key on the crankshaft.

30. Install the crankshaft damper using tool T52L-6306-AEE. Torque the retaining bolt to specifications. Install the accessory drive pulley if so equipped.

31. Install the water pump, alternator, fan pulley, and fan. Install and adjust the drive belt.

32. Prime the oil pump by filling either the inlet or outlet port with engine oil. Rotate the pump shaft to distribute the oil within the pump body.

33. Using a new gasket, install the oil pump. Clean and install the oil inlet tube assembly.

34. Make sure the gasket surfaces of the block and oil pan are clean.

35. Coat the block surface and oil pan gasket surface with oil-resistant sealer and position the gasket on the block (Fig. 54 or 55).

36. Install the oil pan front seal on the cylinder front cover and the oil pan rear seal on the rear main bearing cap (Fig. 54 or 55). **Be sure the tabs on the seals are over the oil pan gasket.**

37. Position the oil pan on the block. Install the retaining screws. Torque the screws from the center outward in each direction to specifications.

38. Install the clutch pilot bushing (Fig. 51). Install the engine rear cover plate, position the flywheel on the crankshaft. Apply oil-resistant sealer to the flywheel bolts and install the retaining bolts. Torque the bolts to specifications.

On a flywheel for a manual-shift transmission, use Tool 7563 to locate the clutch disc. Install the pressure plate. Torque the retaining bolts to specifications.

39. Using a new gasket, install the fuel pump.

40. Turn the crankshaft until No. 1 cylinder is at TDC after the compression stroke. Position the distributor and intermediate drive shaft into the block with the rotor at the No. 1 firing position and the breaker points open. Install the hold down clamp. **Make sure the oil pump intermediate drive shaft is properly seated in the oil pump. It may be necessary to reposition the intermediate shaft in order to engage it in the oil pump.**

41. Install the oil filter insert and oil filter assembly.

42. Dip the valve lifter foot in Lubriplate. Coat the remainder of each valve lifter with engine oil. Install the lifters in their original bores.

43. Clean the head and block gasket surfaces.

44. Inspect the head for any damage and repair as necessary.

45. On a 170 six engine, apply cylinder head gasket sealer to both sides of a new gasket. **Do not apply sealer to the gasket on a 200 six engine.** Install the cylinder head guide studs (Fig. 23). Position the gasket over the guide studs on the cylinder block.

46. Lift the cylinder head over the guides and slide it down carefully. Before installing the cylinder head bolts, coat the threads of the end bolts for the right side of the cylinder head with a small amount of water resistant sealer. Install, but do not tighten, two bolts at opposite ends of the head to hold the head and gasket in position. Remove the guides, then install the remaining bolts.

47. The cylinder head bolts are torqued in three progressive steps. Follow the sequence shown in Fig. 24. Torque the bolts to 55 ft-lbs; then torque them to 65 ft-lbs. Finally, torque the bolts to specifications. When cylinder head bolts have been tightened following this procedure, it is not necessary to retorque the bolts after extended operation. However, on cylinder heads with composition gaskets, the bolts may be checked and retorqued, if required. **After the cylinder head bolts have been torqued to specifications, the bolts should not be disturbed.**

48. Apply Lubriplate to both ends of the push rods. Install the push rods in their proper sequence, positioning the lower end of the rods in the lifter sockets.

49. Apply Lubriplate to the valve tips and the rocker arm pads. Position the valve rocker arm shaft assembly on the head. **Be sure the oil holes in the shaft are facing downward.**

50. Install the valve rocker arm shaft bolts. Tighten them evenly and equally 2 turns at a time until the specified torque is obtained.

51. Refer to Part 8-1, Section 2 and check the valve clearance.

52. Clean the gasket surfaces on the valve rocker arm cover and cylinder head. Coat one side of a new gasket with an oil-resistant sealer and lay the cemented side of the gasket on the cover. Install the cover making sure the gasket seats evenly around the head. Torque the cover bolts to specifications. Torque the cover bolts to specifications again two minutes later.

53. Install the spark plugs. Install the distributor cap and spark plug wire assembly. Connect the spark plug wires. Install the coil on the block and connect the coil on the block and connect the coil high tension lead.

54. Position the exhaust manifold on the cylinder head. Install the tab washers and bolts. Torque the bolts to specifications. Lock the bolts by bending one tab of the washer over a flat on the bolt.

55. Position the carburetor gasket on the manifold. Install the carburetor and spacer as an assembly.

56. Install the carburetor fuel inlet line, the manifold vacuum line and the distributor vacuum line, and the choke heat tube.

57. Install the crankcase ventilation system by following the procedure under Crankcase Ventilation System Installation in Section 2 of this part of the manual. On a vehicle with Thermactor exhaust emission control system, install the backfire suppressor valve, air pump, air cleaner assembly, air manifold assembly and air supply pump. Install the air and vacuum lines and brackets.

58. Install the oil pressure sending unit, dipstick tube and dipstick.

59. Install the engine in the car.

60. Check the ignition timing and adjust if necessary. Connect the distributor vacuum line. Adjust the engine idle fuel mixture and idle speed.

PART 8-3— 289 V-8

1 DESCRIPTION AND OPERATION

The 289 V-8 engines are shown in Figs. 1 through 5. Differences in the engine are called out when they exist. Refer to Fig. 6 for the engine identification and application.

An engine identification tag is attached to the ignition coil bracket; refer to Part 8-1, Section 1.

MANIFOLDS

Coolant flows from the front of the engine through the intake manifold into the heater inlet hose and circulates through the heater. On vehicles that do not have a heater, the coolant is returned to the water pump through a bypass hose.

Exhaust gases flowing through the crossover passage (Fig. 7) provide the initial heat necessary to assist in vaporizing the incoming fuel mixture.

The intake manifold has two sets of fuel passages, each with its own separate inlet connection to the carburetor (Fig. 8). The right barrel(s) of the carburetor feeds Nos. 1, 4, 6 and 7 cylinders and the left barrel(s) feeds Nos. 2, 3, 5 and 8 cylinders.

Filtered air is drawn from the air cleaner, through an air inlet tube, into the heat chamber in the right exhaust manifold. Here the air is heated and then directed to the automatic choke through the air outlet choke tube (Fig. 9).

CYLINDER HEADS

The cylinder head assemblies contain the valves and the valve rocker arm assemblies. The valve guides and push rod guides are machined in the head with a cast combustion chamber. The valve arrangement from front to rear on the left bank is E-I-E-I-E-I-E-I and on the right bank I-E-I-E-I-E-I-E (Fig. 10).

On engines equipped with a thermactor exhaust emission control system, drilled passages within the cylinder heads distribute air from the air pump to orifices in the exhaust ports. The air is injected under pressure and induces combustion of the hydrocarbon and carbon monoxide contaminants at each exhaust outlet ports.

CYLINDER BLOCK

The cylinders are numbered from front to rear, on the right bank 1, 2, 3 and 4 and on the left bank 5, 6, 7 and 8. The firing order is 1-5-4-2-6-3-7-8.

The oil pump, mounted inside the oil pan at the left front, is driven by the distributor through an intermediate drive shaft.

The oil filter is mounted on the left lower front of the block.

The crankshaft is supported by five main bearings. Crankshaft end thrust is controlled by the flanges of the No. 3 main bearing.

The pistons have two compression rings and one oil control ring. The top compression ring is chrome-plated and the lower compression ring is phosphate-coated. The oil control ring assembly consists of a serrated spring and two chrome-plated steel rails.

VALVE TRAIN

The push rods are tubular steel

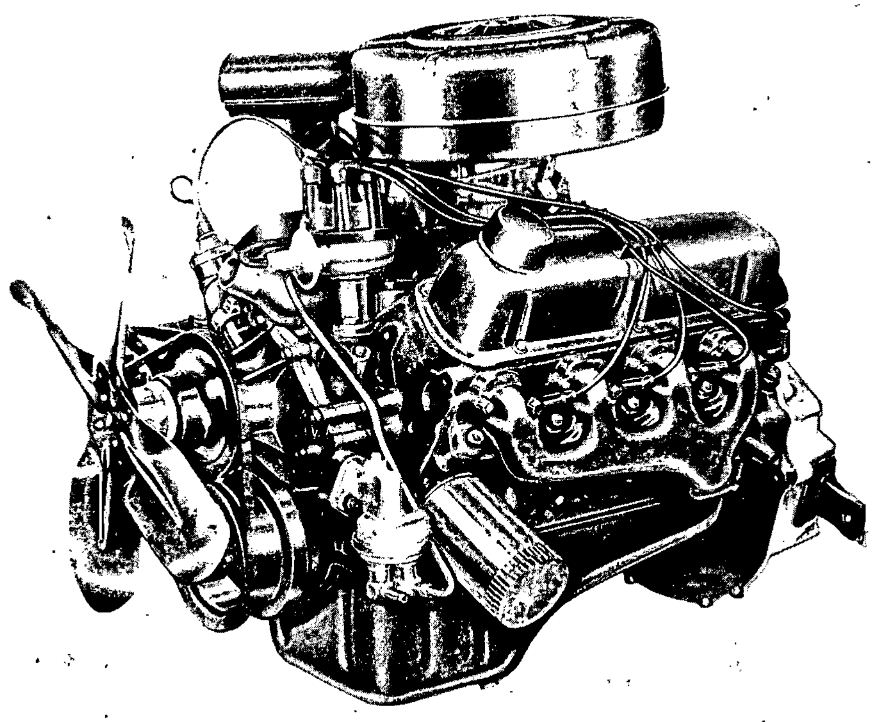


FIG. 1—3/4 Left Front View

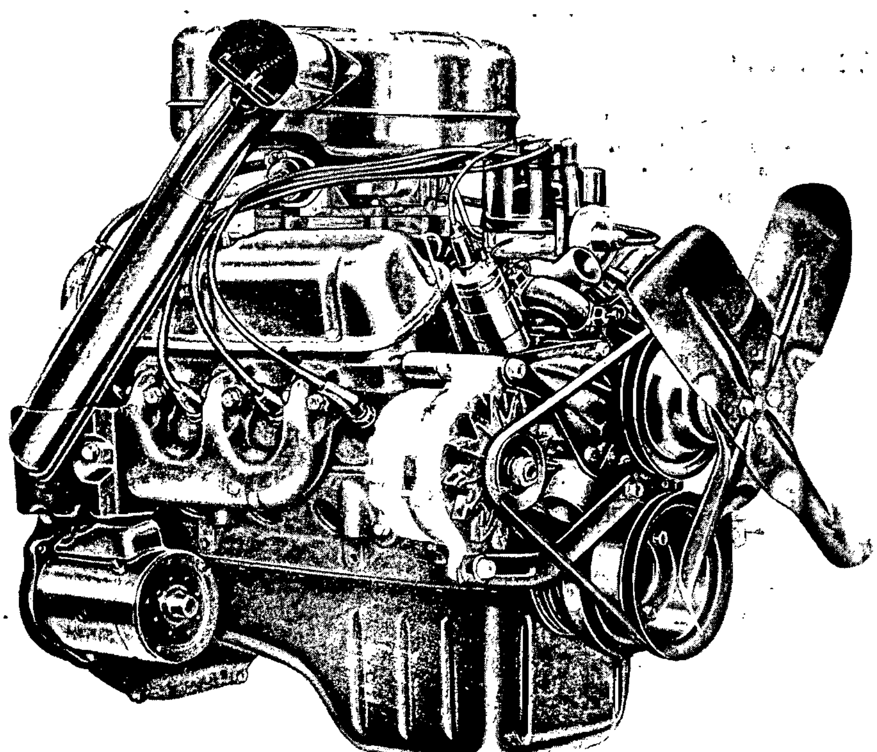


FIG. 2—3/4 Right Front View

with ball ends. The push rods supply oil from a metering valve (disc) in the valve lifters through drilled holes in the ball ends for independent lubrication of each rocker arm.

The rocker arms have a drilled hole in the push rod end for lubrication. They are individually mounted on a stud that is either pressed into the cylinder head on regular performance engines or threaded into the cylinder head on high performance engines. A fulcrum seat permits the rocker motion and a nut secures the rocker arm on the stud. Side movement of the rocker arm is controlled by integral side rails which ride against the valve stem.

The camshaft is supported by five stepped diameter bearings pressed into the block. A dowel is used for positioning the camshaft sprocket. The camshaft is driven by a sprocket and timing chain in mesh with a sprocket on the crankshaft. Camshaft end play is controlled by a thrust plate attached to the cylinder block. An eccentric, bolted to the front end of the camshaft, operates the fuel pump.

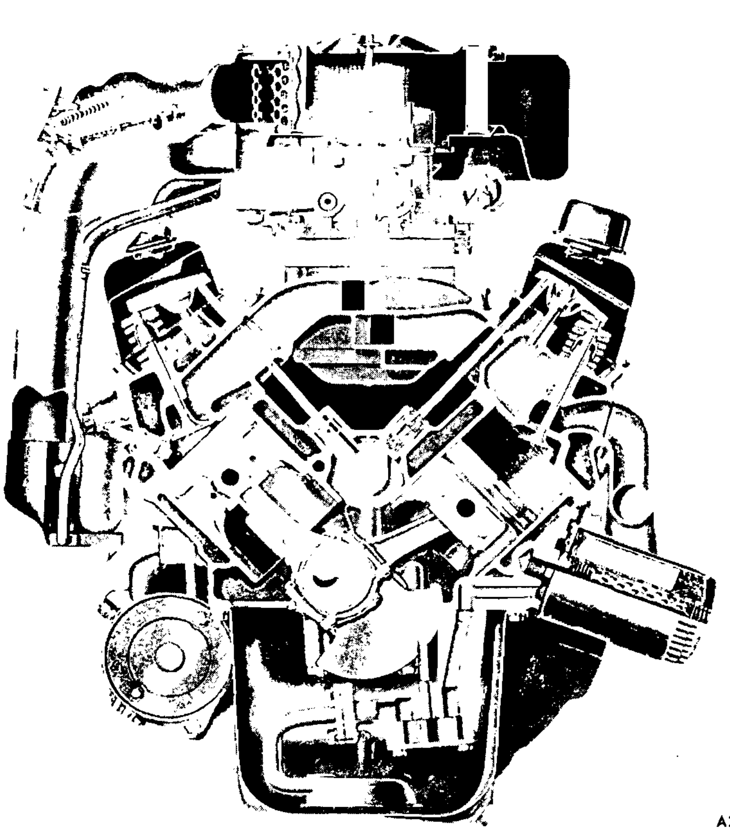
On the 289 high performance V-8 engine, mechanical valve lifters are used. Valve lash is maintained by self-locking adjusting screws.

Two different types of hydraulic valve lifters, (Figs. 11 and 12) are used on all other 289 V-8 engines. These lifters provide zero valve lash and operate on the same principle.

Although the valve lifter assemblies are interchangeable, or both may be used, on the same engine, **the component parts are not interchangeable.** The valve lifters are easily identified, type II having three circumferential ribs on the barrel near the oil hole. On the type II design lifter, an upper metering valve retainer with tensioning finger is used, whereas in type I the metering valve is flat.

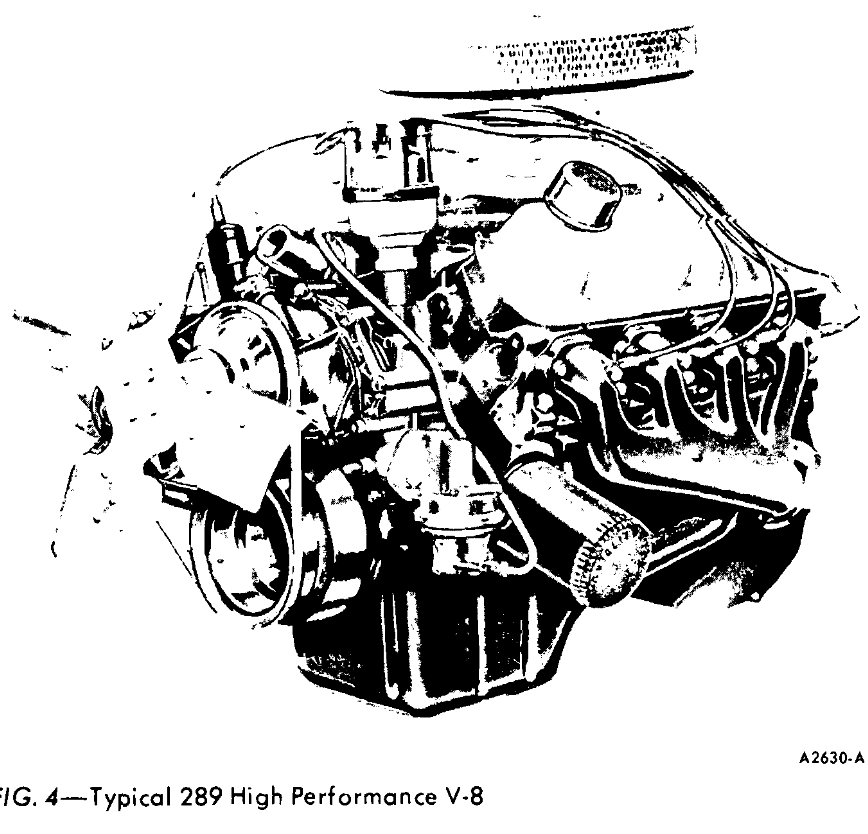
When the valve is closed, the lifter assembly is on the base circle of the camshaft lobe and the valve push rod is in its lowest position. With the lifter assembly in this position, the plunger spring expands, forcing the plunger upward. This action is transmitted to the valve rocker arm via the valve push rod until there is solid contact between the valve and the valve end of the valve rocker arm (zero valve lash).

As the lifter plunger moves upward, the volume of the compression chamber is increased, resulting in reduced oil pressure in the compression chamber. Therefore, to equalize the resulting pressure differential between the supply chamber and the compression chamber, the disc



A2632-A

FIG. 3—Front Cross Sectional View



A2630-A

FIG. 4—Typical 289 High Performance V-8

valve moves off its seat and permits oil to flow from the supply chamber to the compression chamber. When the compression chamber becomes filled with oil, the pressures in the two chambers are equalized. The oil flow ceases and the disc valve spring seats the disc valve and closes the disc valve port.

As the camshaft rotates, the lifter assembly is raised by the camshaft lobe. This increases the push rod force against the lifter plunger and hydraulic pressure immediately builds up in the compression chamber until it acts as a solid member of the valve operating mechanism. The lifter then becomes a hydraulic ram which forces the valve in the cylinder head to open. During this period, a slight leakage of oil past the plunger occurs (calibrated leak down rate).

As the high point of the camshaft lobe rotates and passes by the foot of the valve lifter, the valve in the cylinder head seats and the valve lifter assembly is forced downward. Reduced force on the lifter plunger at this time relieves the pressure on the lifter plunger and it is free to be moved upward by the plunger spring. This action allows oil to flow once again through the oil holes in the lifter body and plunger.

The operating cycle is completed for each revolution of the camshaft. Zero clearance (lash) in the valve train mechanism is maintained at all times by the hydraulic force and expansion of the plunger spring between the lifter body and plunger.

LUBRICATION SYSTEM

Oil from the oil pan sump, located in the front of the oil pan, is forced through the pressure-type lubrication system (Fig. 13) by a rotor oil pump. A spring-loaded relief valve in the pump limits the maximum pressure of the system. Oil relieved by the valve is directed back to the intake side of the pump.

All the oil discharged by the pump passes through an exclusive design full flow-type Autolite filter before it enters the engine. The filter is mounted at the lower left front of the engine.

On a cartridge-type oil filter, a relief valve in the filter permits oil to bypass the filter if the element becomes clogged.

On an element-type oil filter, a bypass in the center bolt provides oil to the engine in case the filter element becomes clogged. The bypass is located in the hollow center bolt of the filter and consists of a spring-

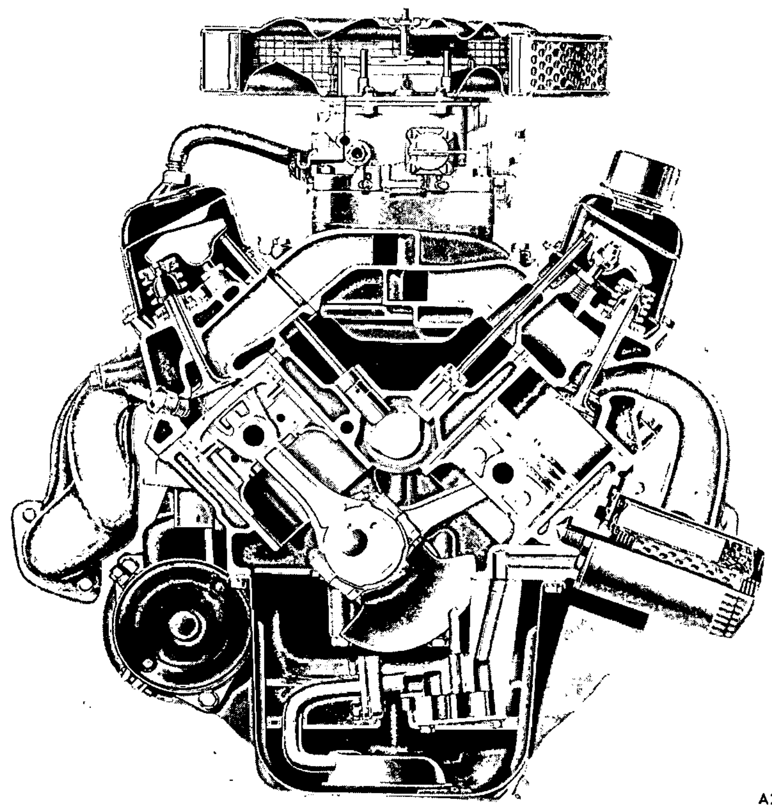


FIG. 5—Typical 289 High Performance V-8 Engine Sectional

loaded valve. When the element is clean and oil will flow through it, the pressure difference between the inner and outer faces of the valve is not great enough to overcome the spring pressure behind the valve. Therefore, no oil flows through the bypass. When the element is dirty and will not permit a sufficient flow of oil, the pressure acting on the inner face of the valve drops. If the pressure difference between the valve faces is great enough to overcome spring pressure, the valve will open. Oil then bypasses the element, main-camshaft bearing by an oil drip the engine.

From the filter, the oil flows into the main oil gallery which is located to the right side of the camshaft. The oil gallery supplies oil to each individual main bearing, through drilled passages in the block. Passages are drilled from each main bearing to each camshaft bearing. Number 1 main bearing feeds No. 1 camshaft bearing, and No. 2 main bearing feeds No. 2 camshaft bearing, etc. The oil then flows through notches or grooves in the main bearings to lubricate the crankshaft journals. The timing chain and sprockets are lubricated by oil deflected from the front camshaft bearing by an oil drip trough on the cylinder front cover.

The crankshaft is drilled from the main bearings to the connecting rod bearings.

Oil passages are drilled from the main oil gallery to each valve lifter oil gallery. Oil from here feeds the valve lifter assemblies. A reservoir at each valve lifter bore boss traps oil so that oil is available for valve lifter lubrication as soon as the engine starts.

The oil hole in the hydraulic lifter is indexed with the lifter oil gallery and oil flows into the lifter. Oil in the lifter is then metered through the metering valve (disc), through the oil passages in the push rod cup and then flows up the hollow push rod. In this position, the drilled hole in the ball end of the push rod is indexed with a drilled hole in the rocker arm and the oil lubricates the upper valve train bearing areas (Fig. 13). Excess oil is returned to the oil pan through drain back holes located at each end of the cylinder heads and block (Fig. 13).

AIR INTAKE SYSTEM

The temperature of the air entering the air cleaner is thermostatically controlled by an air intake duct and thermostat assembly (Fig. 2). This system supplies warm air to the engine during the warm-up period, resulting in better fuel vaporization and reducing the possibility of carburetor icing. The air duct shroud and tube assembly together with the air duct and thermostat assembly direct warm air into the air cleaner and carburetor.

If the temperature of the air passing over the thermostat is less than 75° F., the valve plate in the air duct is held in an up or heat on position by a valve plate tension spring. When the valve plate is in the "heat on" position, the air entering the air cleaner is drawn through the shroud and tube assembly. The air passing through the shroud and tube is first

Engine	Patent Plate Code	Engine Prefix	Piston Displacement	Bore and Stroke	Compression Ratio	Valve Lifters	Carburetor	Distributor	Fuel Required	Model Application
289	C	EGA	289	4.00 x 2.87	9.3:1	Hydraulic	2-V Autolite	Dual Advance	Regular	Mercury Inter-mediate, Cougar, Fairlane, Falcon and Mustang
289	A	EGA	289	4.00 x 2.87	9.8:1	Hydraulic	4-V Autolite	Dual Advance	Premium	Mustang, Cougar and Falcon
289 High Performance	K	EGA	289	4.00 x 2.87	10.5:1	Mechanical	4-V Autolite	Centrifugal Advance	Premium	Mustang

FIG. 6—Engine Identification and Application

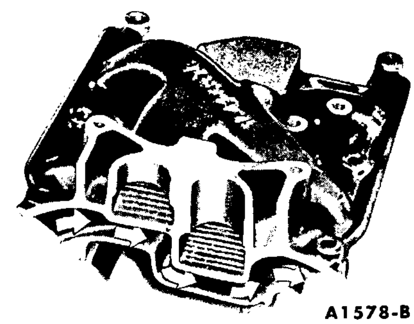


FIG. 7—Intake Manifold Exhaust Gas Crossover Passage

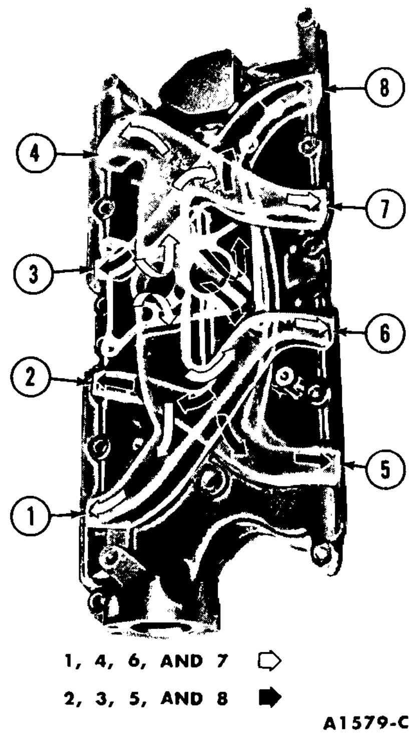


FIG. 8—Typical Intake Manifold Fuel Passages

directed over the exhaust manifold and heated.

A wax-filled thermostat is connected to the valve plate by a thermostat rod. The incoming air passes over the thermostat before entering the air cleaner. As the temperature of the air passing over the thermostat approaches 85° F., the wax begins to expand and pushes the thermostat rod against the valve plate. The tension of the valve plate spring is overcome and the valve plate is moved downward to partially close off the warm air duct to allow the cooler air from the engine compartment to mix with the warm air directed from the exhaust manifold.

If the temperature of the incoming air is approximately 105° F., the valve plate moves downward to a

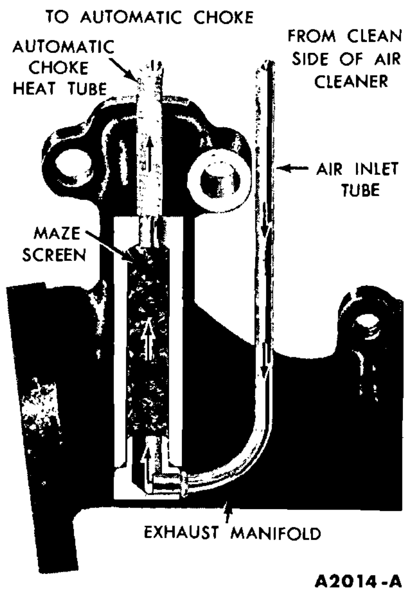


FIG. 9—Automatic Choke Heat Chamber

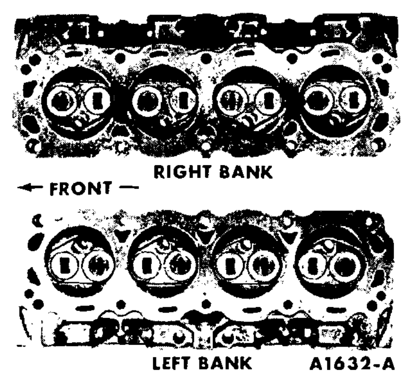


FIG. 10—Valve Part Arrangement

heat-off position to close off the warm air duct. Cooler air from the engine compartment is then directed to the air cleaner without passing over the exhaust manifold.

COOLING SYSTEM

The coolant is drawn from the bottom of the radiator by the water pump which delivers the coolant to the cylinder block (Fig. 14).

The coolant travels through cored passages to cool the entire length of each cylinder wall. Upon reaching the rear of the cylinder block, the coolant is directed upward into the cylinder heads, where it cools the combustion chambers, valves and valve seats on its return to the front of the engine.

The coolant from each cylinder head flows through the water passages in the intake manifold past the water thermostat, if it is open, into the top of the radiator. If the thermostat is closed, a small portion of the coolant is returned to the water pump for recirculation. The entire system is pressurized and controlled by the radiator pressure cap.

A centrifugal-type water pump is mounted on the cylinder front cover. The water pump inlet port is connected to the radiator lower header tank to draw coolant from the radiator when the thermostat is open. A bypass port on the water pump is connected to the coolant outlet housing to permit coolant circulation within the engine when the thermostat is closed, bypassing the radiator.

The water pump has two outlet ports, one for each cylinder bank, to

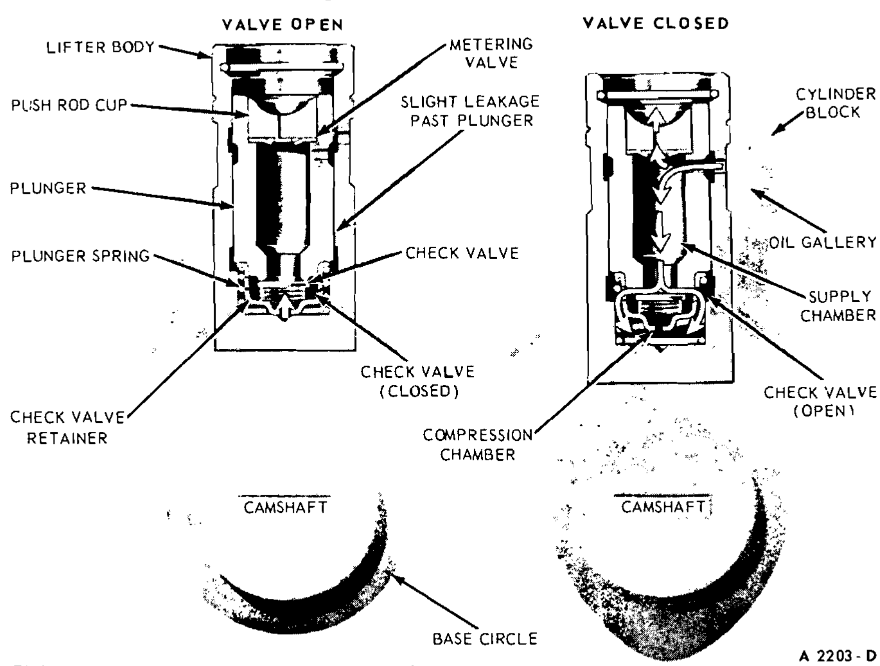


FIG. 11—Type I Hydraulic Valve Lifter

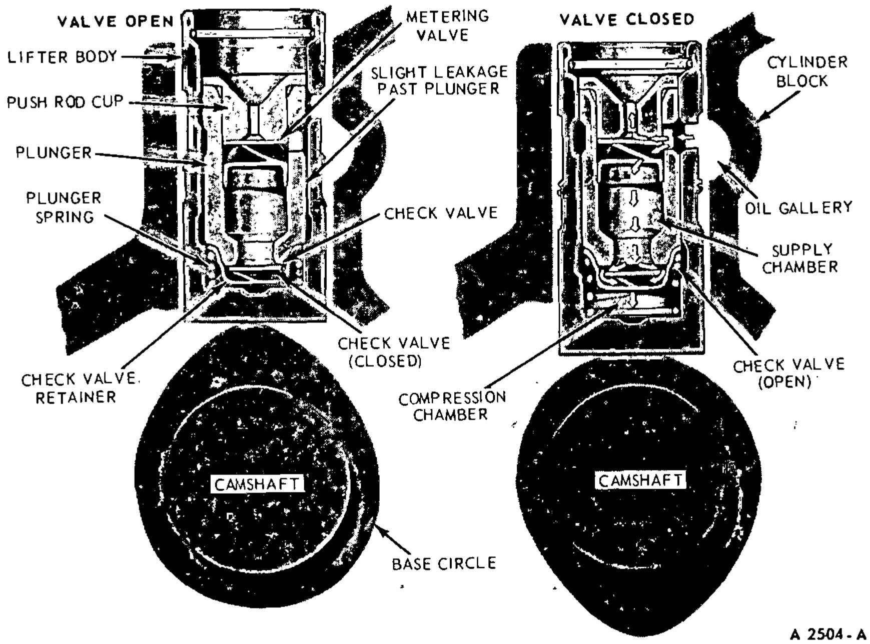


FIG. 12—Type II Hydraulic Valve Lifter

provide uniform coolant circulation in both banks of the engine.

The water pump has a sealed bearing integral with the water pump shaft. The bearing requires no lubrication. A bleed hole in the water pump housing allows water that may leak past the seal to be thrown out by the slinger. **This is not a lubrication hole.**

The cooling fan hub is pressed a specified distance onto the water pump shaft.

POSITIVE CRANKCASE VENTILATION SYSTEM

The engine is equipped with a positive crankcase ventilation system. In the positive system, the crankcase vapors are directed to the intake manifold.

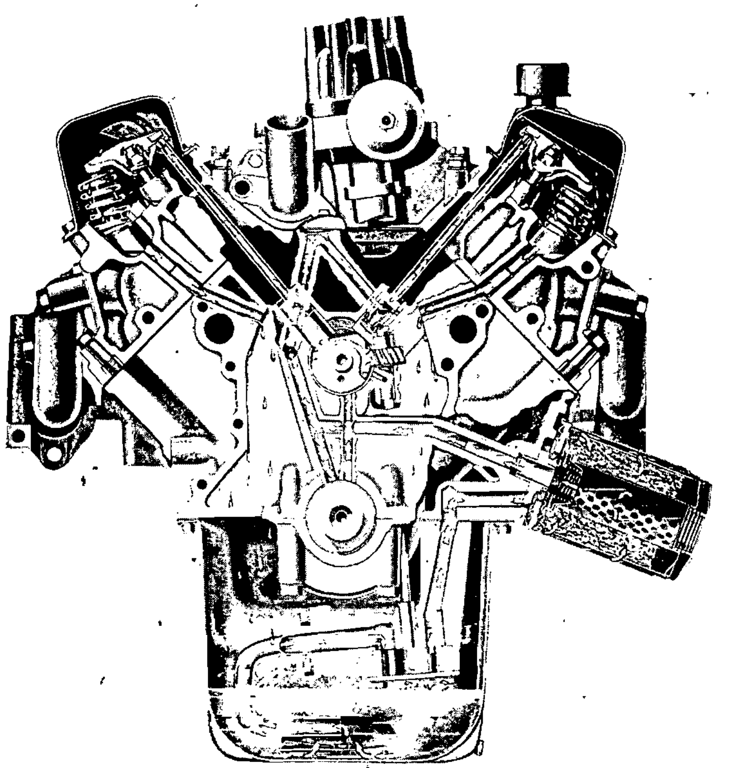
OPEN VENTILATION SYSTEM

The air flow in the positive crankcase ventilation system is shown in Fig. 15.

Ventilating air enters the engine through the oil filler cap located on the front of the left valve rocker arm cover. The filler cap contains a filtering element which filters the incoming air.

From the oil filler cap, the air flows into the front section of the valve rocker arm chamber. The ventilating air moves down past the push rods into the front of the lower crankcase and into the timing chain chamber.

The rotating action of the crankshaft causes the air to flow towards the rear of the crankcase and up into the rear section of the right valve rocker arm cover. The air then enters a spring-loaded regulator valve that regulates the amount of air to meet changing operating conditions. The air is then directed to the intake manifold through the crankcase vent hose.



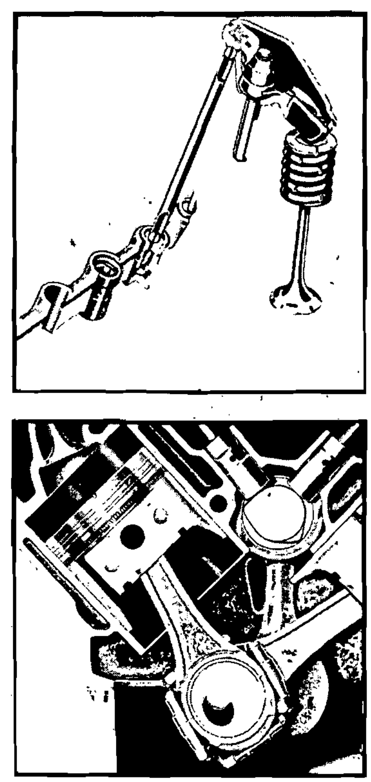


FIG. 13—Lubrication System

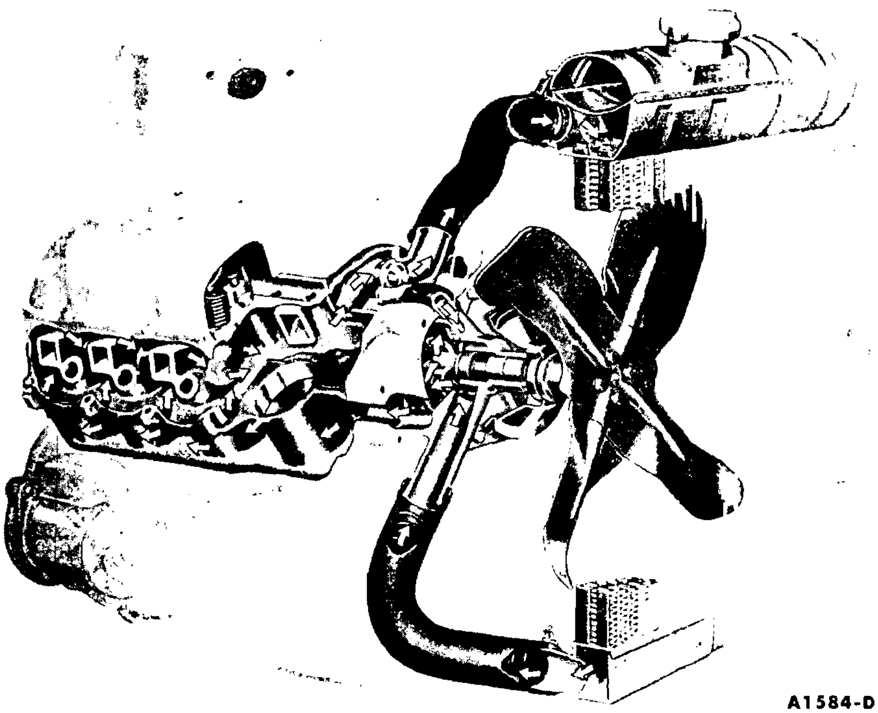


FIG. 14—Cooling System

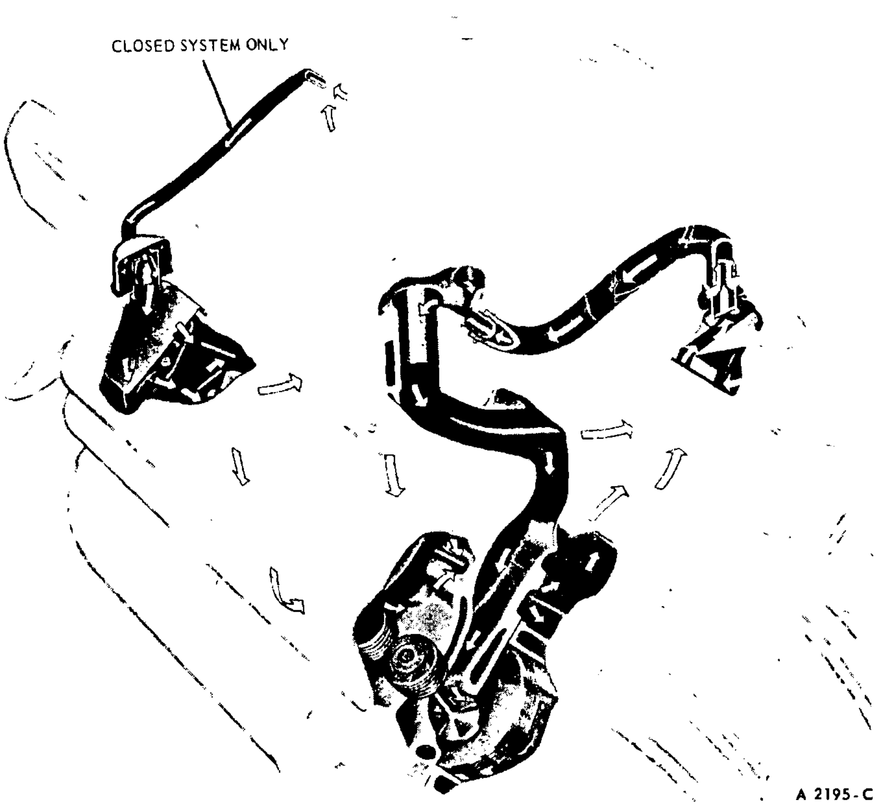


FIG. 15—Positive Crankcase Ventilation System

At idle speed, intake manifold vacuum is high. The high vacuum overcomes the tension of the spring pressure and moves the valve to the Low-Speed Operation position (Fig. 16). With the valve in this position, the ventilating air passes between the valve (jiggle pin) and the outlet port. With the valve in this position, there is a minimum ventilation.

As engine speed increases and manifold vacuum decreases, the spring forces the valve to the full open position (Fig. 16). This increases the flow of ventilating air.

CLOSED VENTILATION SYSTEM

The closed ventilation system is the same as the open ventilation system except for the following:

The crankcase ventilating air source is the carburetor air cleaner. The air passes through a hose connecting the air cleaner to the oil filler cap. The oil filler cap is sealed at the filler opening to prevent the entrance of atmospheric air. A restriction in the air cleaner at the hose connection, assists the crankcase ventilation regulator valve in maintaining a slight vacuum in the crankcase.

THERMACTOR EXHAUST EMISSION CONTROL SYSTEM

The Thermactor exhaust emission control system is designed to reduce the hydrocarbon and carbon monoxide content of gasoline engine exhaust gases. By controlling the amount of contaminants emitted through the exhaust system to an acceptable minimum, air pollution is reduced.

Control of exhaust-emitted gases by the Thermactor system is achieved by burning the hydrocarbon and carbon monoxide concentrations in the exhaust ports of the cylinder head(s). To accomplish this burning of the contaminants, air under pressure is injected into the exhaust ports near each exhaust valve. The oxygen in the air plus the heat of the exhaust gases in each exhaust outlet port induces combustion during the exhaust stroke of the piston. The burned gases

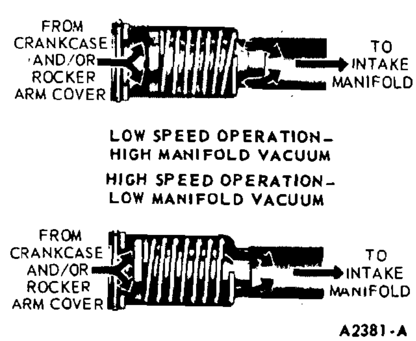


FIG. 16—Positive Crankcase Ventilation Regulator Valve Operation

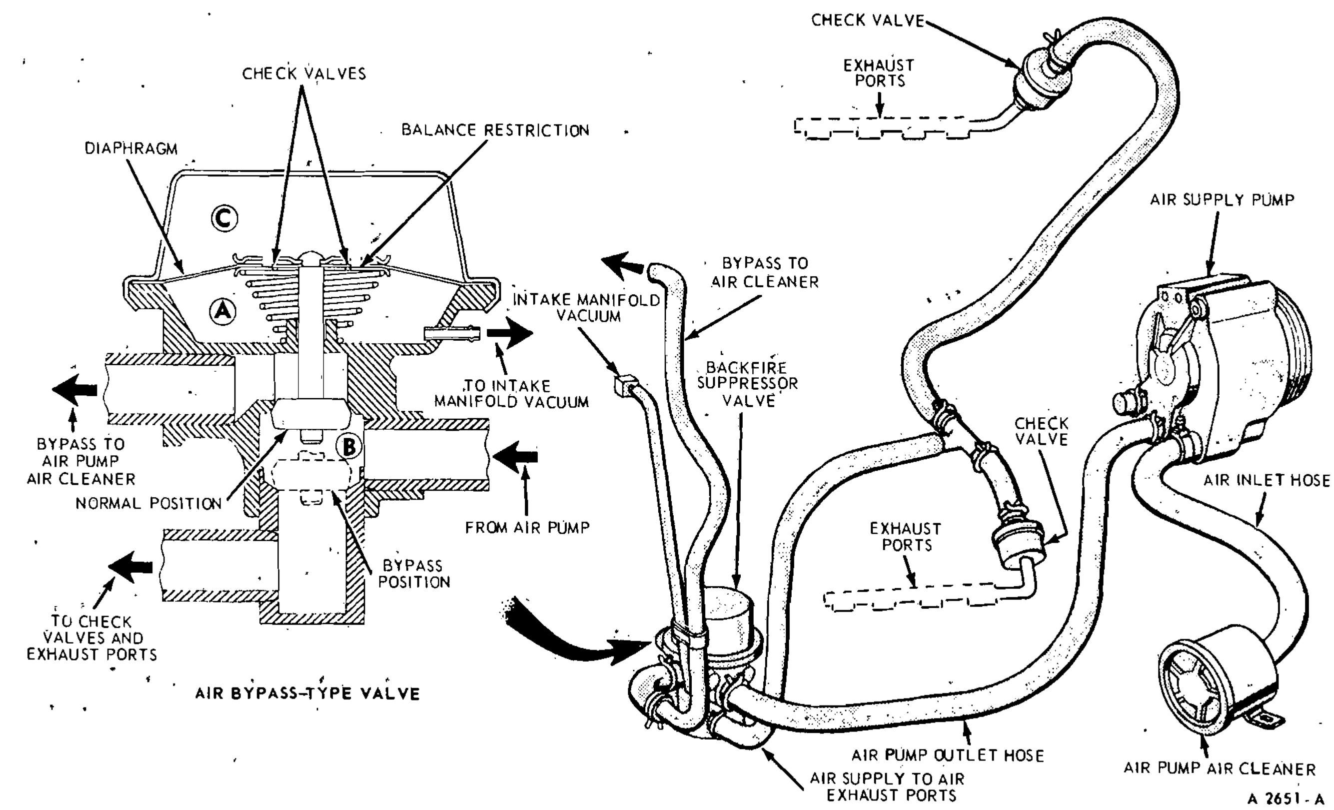


FIG. 17—Thermactor Exhaust Emission Control System With Air Bypass – Type Valve

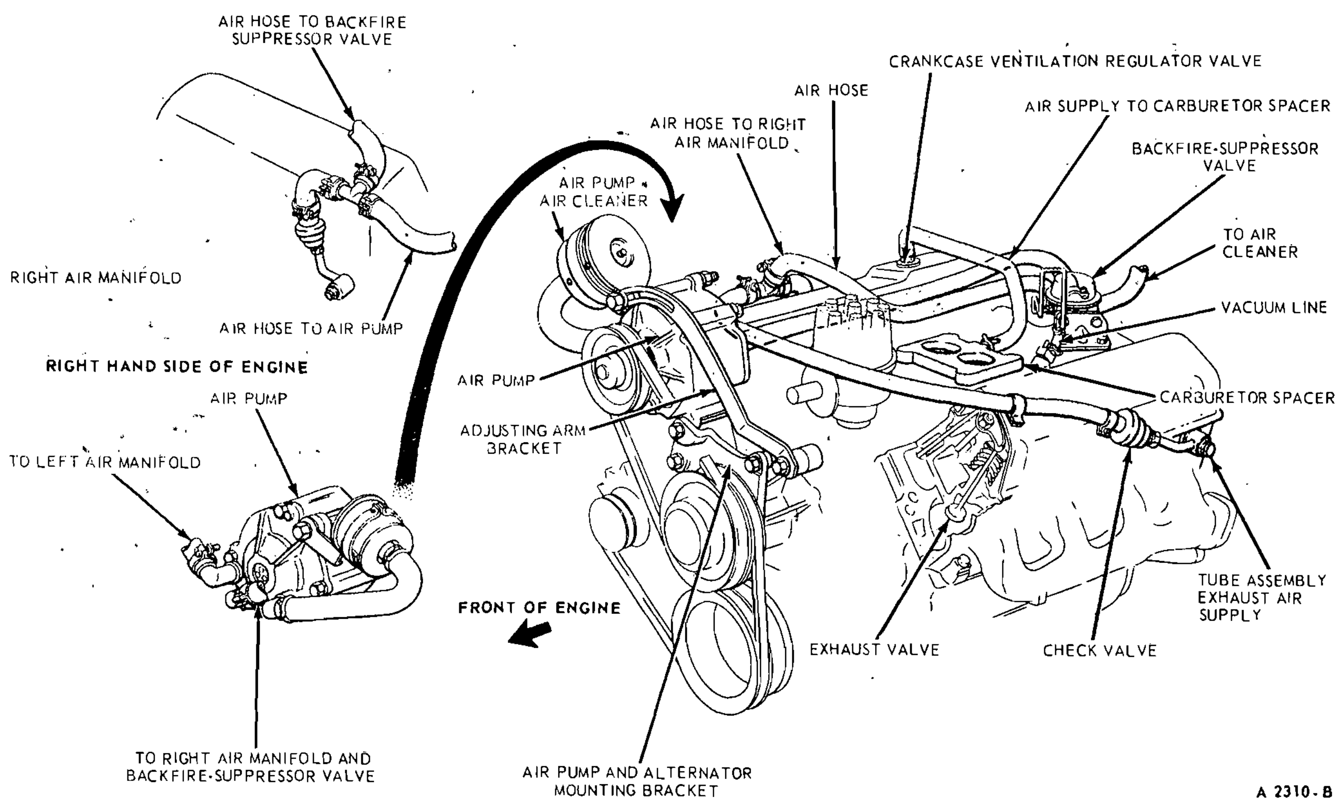


FIG. 18—289 V-8 Engine With Thermactor Exhaust Emission System

then flow out the exhaust manifold into the exhaust system.

The Thermactor system consists of: an air supply pump; a backfire-suppressor valve; an air cleaner; a check valve on each cylinder head; an air passage to the exhaust port of each engine cylinder; and the connecting air supply hoses and vacuum sensing line.

A schematic of the Thermactor system is shown in Fig. 17. The Thermactor system is shown installed in Fig. 18.

Air under pressure from the pump flows to the exhaust ports of the cylinder heads. A check valve is incorporated in the inlet air side of the cylinder heads. The check valve prevents a backflow of exhaust gases into the air pump during operating periods when the exhaust back pressure exceeds the air pump delivery pressure.

All the air from the air supply pump passes through the bypass valve. Normally, the air is directed to the check valve and into the cylinder heads. During engine deceleration periods, air delivery to the cylinder heads is momentarily interrupted and the air is diverted to the air pump cleaner.

2 IN-VEHICLE ADJUSTMENTS AND REPAIRS

When installing nuts or bolts that must be torqued (refer to Part 8-5 for torque specifications), oil the threads with light weight engine oil. **Do not oil threads that require oil-resistant or water-resistant sealer.**

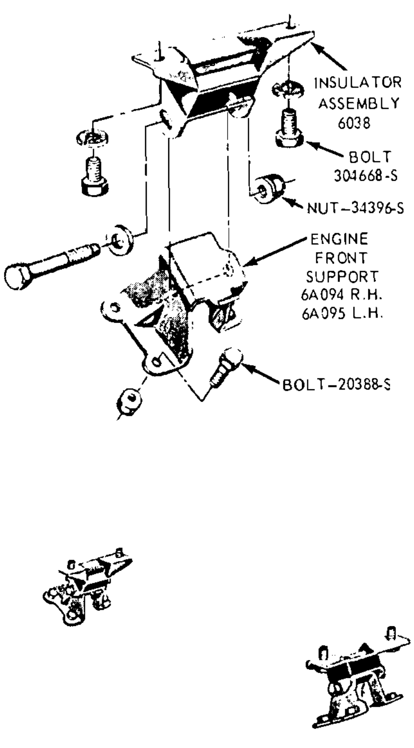


FIG. 19—Mercury Intermediate, Fairlane and Falcon Engine Front Supports

ENGINE FRONT SUPPORT INSULATORS

The front supports are located on each side of the cylinder block (Figs. 19 and 20). The procedures given apply to either a right or left installation.

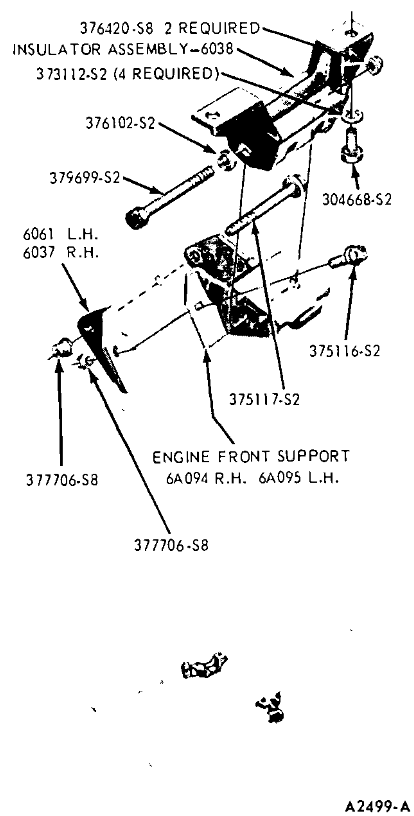


FIG. 20—Cougar and Mustang Engine Front Supports

MUSTANG AND COUGAR

Removal

1. Raise the engine with a jack and wood block placed under the oil pan.
2. Remove bolts and washers attaching engine mount to engine.
3. Remove bolts and washers attaching engine mount brackets to side supports.
4. Remove engine mount bracket assembly.
5. Detach engine mount from bracket by removing long bolts and nuts.

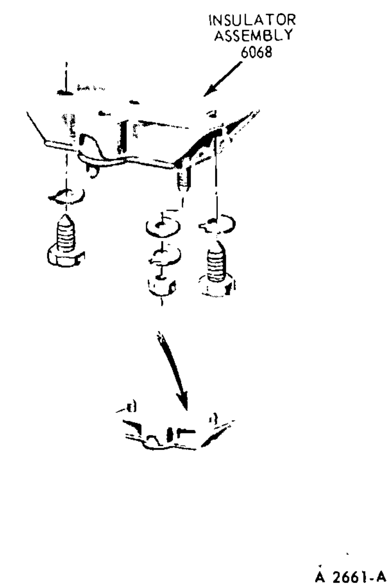


FIG. 21—Mercury Intermediate, Fairlane and Falcon Engine Rear Support

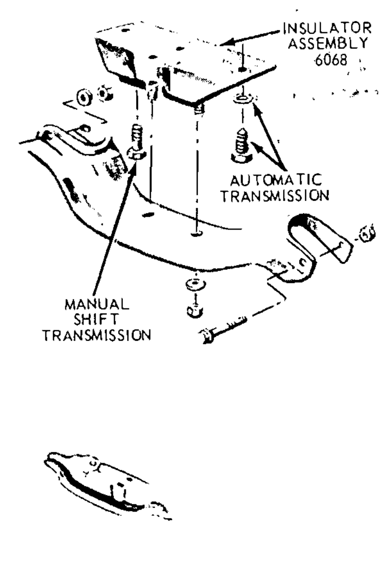


FIG. 22—Cougar and Mustang Engine Rear Support

Installation

1. Attach engine mount to bracket with long bolts and nuts. Torque to specifications.
2. Install engine mount/bracket assembly.
3. Install bolts and washers attaching engine mount brackets to side supports. Torque bolts to specification.
4. Install bolts and washers attaching engine mount to engine. Torque bolts to specifications.

MERCURY INTERMEDIATE, FALCON AND FAIRLANE

Removal

1. Support the engine with a jack and a piece of wood placed under the oil pan.
2. Remove the insulator assembly to support bolt, washer and nut from both front supports.
3. Using the jack and block of wood placed under the oil pan, raise the engine enough to allow for removal of the insulator assembly.
4. Remove the bolts and lock washers retaining the insulator assembly to the engine.

Installation

1. Place the insulator assembly in position on the engine block and install the bolts and washers. Torque the bolts to specifications.
2. Lower the engine enough to allow installation of the insulator assembly to support bolt washer and nut. Torque to specifications.
3. Remove the jack and block of wood from under the oil pan.

ENGINE REAR SUPPORT INSULATOR

REMOVAL

1. Remove bolts and washers attaching engine mounts to transmission (Figs. 21 and 22).
2. Raise the transmission with a floor jack.
3. Remove bolts attaching crossmember to underbody stringer.
4. Remove crossmember and engine mount assembly.
5. Remove bolts and washers and separate crossmember from engine mount.

INSTALLATION

1. Install bolts and washers and attach crossmember to engine mount:
2. Install crossmember and engine mount assembly.
3. Install bolts attaching crossmember to underbody stringer.
4. Lower the transmission and remove jack.
5. Install bolts and washers attaching engine mounts to transmission. Torque to specifications.

THERMACTOR DRIVE BELT ADJUSTMENT

The air supply pump drive belt should be properly adjusted at all times. A loose drive belt causes improper air pump operation. A belt that is too tight places a severe strain on the air pump bearings.

Properly tensioned drive belts minimize noise and also prolong service life of the belt. Therefore, it is recommended that a belt tension gauge be used to check and adjust the belt tension. **Any belt that has operated for a minimum of 10 minutes is considered a used belt, and, when adjusted, it must be adjusted to the reset tension shown in the specifications.**

1. Install the belt tension tool (T63L-8620-A) on the drive belt and check the tension following the instructions of the tool manufacturer. Compare the belt tension to the specified belt tension (Part 8-5) and adjust as necessary.
2. If adjustment is necessary, loosen the air pump mounting and adjusting arm bolts (Fig. 18). Move the air pump toward or away from the engine until the correct tension is obtained. **Use a suitable bar and pry against the pump rear cover** to hold belt tension while tightening the mounting bolts. **Do not pry against the pump housing.** Remove the gauge. Tighten the air pump adjusting arm and mounting bolts. Install the tension gauge and check the belt tension.

THERMACTOR AIR PUMP AIR CLEANER ELEMENT REPLACEMENT

1. Remove the wing nut (Fig. 23) and the cover assembly. Remove the filter element from the cover assembly.
2. Wipe the cover assembly and air cleaner with a clean, lint-free cloth to remove any accumulated dirt or foreign matter. Under extremely dirty conditions, it may be necessary to wash both the cover and body in low-volatility mineral spirits. Be sure the parts are dry before installing them.
3. **The filter element is not cleanable. Refer to the Maintenance and Lubrication Manual for the recommended replacement interval.** Place a new filter element on the cover assembly. Position the assembled cover and filter element in the air cleaner body. **Be sure the tang is fitted in the slot (Fig. 23).** Install the wing nut.

THERMACTOR AIR CLEANER

REMOVAL

Disconnect the air hose from the air cleaner body. Remove the air cleaner mounting bracket screws and remove the air cleaner.

INSTALLATION

Position the air cleaner and mounting bracket assembly in the same way that it was previously installed, and install the mounting bracket screws. Connect the air hose to the air cleaner body.

THERMACTOR AIR PUMP DRIVE BELT REPLACEMENT

1. Loosen the air supply pump adjusting arm nut and bolt (Fig. 18). Loosen the air supply pump to mounting bracket nut and bolt, and push the air pump towards the cylinder block. Remove the drive belt.
2. Install a new drive belt. With a suitable bar, **pry against the rear cover of the air pump** to obtain the specified belt tension (refer to Part 8-5), and tighten the adjusting arm bolt and nut. **Do not pry against the pump housing.** Adjust the belt tension (refer to Section 3) as necessary. **Always use a belt tension gauge (Tool T63L-8620-A) to check belt tension**
3. Tighten the air supply pump to mounting bracket bolt and nut.

BACKFIRE—SUPPRESSOR VALVE

REMOVAL

Disconnect the air hoses and vacuum line at the backfire suppressor valve body (Fig. 18). Remove the valve to mounting bracket bolts and separate the valve from the mounting bracket.

INSTALLATION

Position the backfire-suppressor valve on the mounting bracket, and install the attaching bolts. Be sure the valve is positioned properly (Fig. 18), and connect the air hoses and vacuum lines.

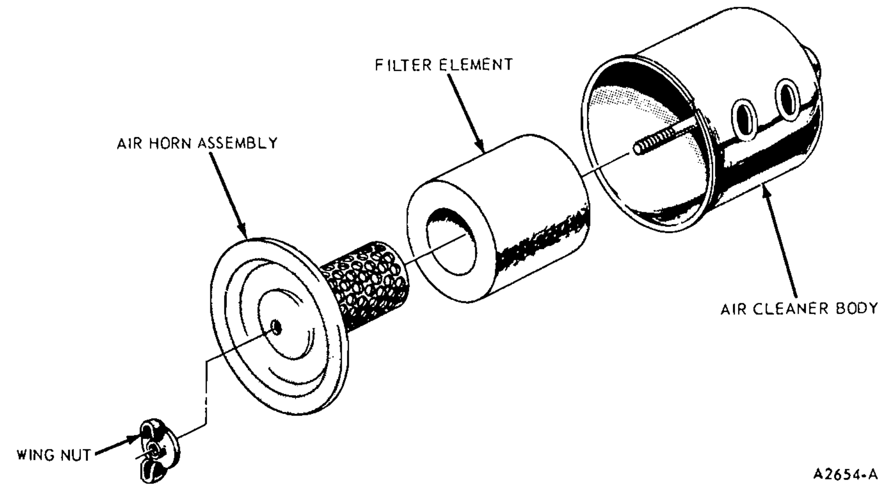


FIG. 23—Thermactor Exhaust Emission System Air Cleaner

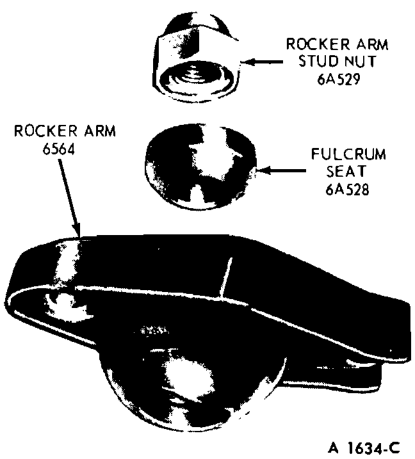


FIG. 24—Valve Rocker Arm Assembly

THERMACTOR CHECK VALVE REPLACEMENT

1. Disconnect the air supply hose at the valve. Unscrew the check valve assembly (the valve has a standard, right-hand pipe thread) from the tube assembly on the cylinder head.
2. Install the check valve and torque it to specifications. Connect the air supply hose.

THERMACTOR AIR PUMP DRIVE PULLEY REPLACEMENT

1. Loosen the air supply pump adjusting arm and mounting bolts and nuts to relieve the belt tension.
2. Remove the drive pulley attaching bolts and pull the drive pulley off the air pump shaft.
3. Position the drive pulley on the air supply pump shaft, and install the retaining bolts. Torque the bolts in sequence, across from each other, to specifications.
4. Position the drive belt and adjust the belt tension (Section 3) to specifications. Tighten the adjusting arm and mounting bolts and nuts.

THERMACTOR AIR SUPPLY PUMP

REMOVAL

1. Disconnect the air inlet and outlet hoses at the air pump.
2. Loosen the adjusting arm to air pump and air pump to mounting bracket bolts to relieve the drive belt tension.
3. Disengage the drive belt. Remove the mounting bolts and air pump.

REPAIR

For disassembly and repair procedures, refer to Part 8-1, Section 2.

INSTALLATION

1. Position the air pump on the mounting bracket and install the mounting bolt and nut.
2. Place the drive belt in the pulleys and attach the adjusting arm

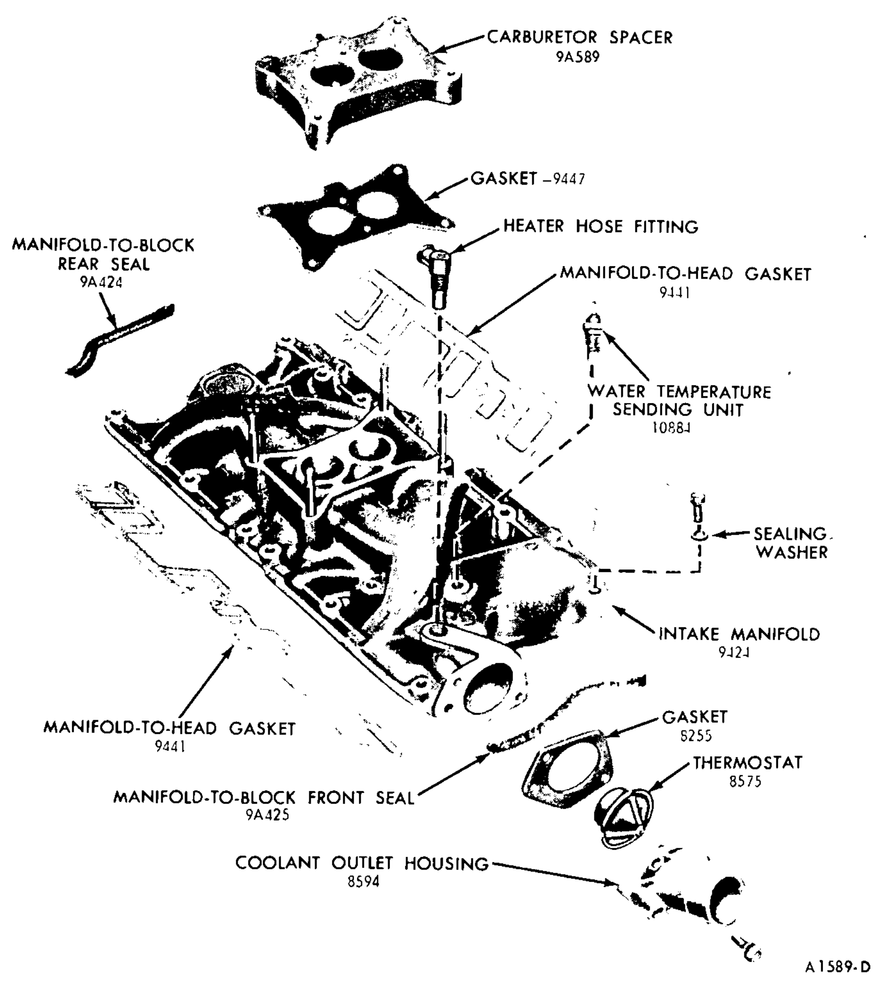


FIG. 25—Typical Intake Manifold Assembly

to the air pump. Adjust the drive belt tension to specifications and tighten the adjusting arm and mounting bolts.

3. Connect the air inlet and outlet hoses to the air pump.

THERMACTOR AIR PUMP RELIEF VALVE REPLACEMENT

Do not disassemble the air pump to replace the relief valve, but remove it from the engine.

1. Position Tool T66L-9A486-D on the air pump and remove the relief valve with the aid of a slide hammer (T59L-100-B).
2. Position the relief valve on the pump housing and hold Tool T66L-9A486-B on the relief valve. Use a hammer to **tap the tool lightly** until the relief valve is seated.

THERMACTOR RELIEF VALVE PRESSURE SETTING PLUG

REMOVAL

1. Remove the relief valve silencer.
2. Using a small screwdriver, bend the three locking tabs inward and remove the plug.

INSTALLATION

1. Before installing the new plug, be sure that the plug is the correct one. The correct plug for this engine should be color coded blue.
2. Insert the plug in the relief valve hole.
3. Using a 1/4 inch diameter rod, push the plug in until the three locking tabs are spread out on the under side of the relief valve cover. The three depth control tabs should be seated on the top of the relief valve cover.
4. Install the relief valve silencer.

VALVE ROCKER ARM ASSEMBLY

The valve rocker arm assembly is shown in Fig. 24.

REMOVAL

1. To remove a valve rocker arm assembly from the right cylinder head, disconnect the automatic choke heat chamber air inlet hose at the inlet tube near the right valve rocker arm cover.

Remove the air cleaner and intake duct assembly.

Remove the automatic choke heat tube. Remove the crankcase ventilation regulator valve from the valve rocker arm cover.

If the engine is equipped with a Thermactor exhaust emission control system, disconnect the air hose and remove the check valve from the right air manifold.

2. Disconnect the spark plug wires from the spark plugs by grasping, twisting and pulling the moulded cap only. Remove the wires from the bracket on the valve rocker arm cover(s) and position the wires out of the way.
3. If the engine is equipped with a Thermactor exhaust emission control system, disconnect the air hose as necessary.
4. Remove the valve rocker arm cover(s).
5. Remove the valve rocker arm stud nut, fulcrum seat and rocker arm.

CLEANING AND INSPECTION

Refer to Part 8-1, Section 3 for the cleaning and inspection procedures.

REPAIRS

If removal of the rocker arm stud is necessary, refer to the procedure under Cylinder Head Repairs in Part 8-1, Section 2.

INSTALLATION

1. Apply Lubriplate to the top of the valve stem.
2. Apply lubriplate to the fulcrum seat and socket, then install the valve rocker arm, fulcrum seat and stud nut. Adjust the valve clearance following the procedure in Part 8-1, Section 2.
3. Clean the valve rocker arm cover(s) and the cylinder head gasket surface(s). Apply oil-resistant sealer to one side of new cover gasket(s). Lay the cemented side of the gasket(s) in place in the cover(s).
4. Position the cover(s) on the cylinder head(s). Make sure the gasket seats evenly all around the head. Install the bolts. The cover is tightened in two steps. Torque the bolts to specifications. Two minutes later, torque the bolts to the same specifications.

If the engine is equipped with a Thermactor exhaust emission control system, connect the air hose(s).

If the right rocker arm cover was removed, install the check valve to the air manifold.

If the right cover was removed, install the automatic choke heat tube and the crankcase ventilation regulator valve.

Connect the automatic choke heat chamber air inlet hose.

Install the air cleaner and intake duct assembly.

5. Install the spark plug wires in the bracket on the valve rocker arm cover(s). Connect the spark plug wires.

INTAKE MANIFOLD

The intake manifold assembly is shown in Fig. 25.

REMOVAL

1. Drain the cooling system. Disconnect the automatic choke heat chamber air inlet hose at the inlet tube near the right valve rocker arm cover. Remove the air cleaner and intake duct assembly.
2. Disconnect the accelerator rod at the carburetor. Remove the accelerator retracting spring.

On a car equipped with vacuum operated accessories, disconnect any vacuum lines that are connected to the intake manifold.

3. Disconnect the high tension lead and wires at the coil.
4. Disconnect the spark plug wires at the spark plugs by grasping, twisting and pulling the moulded cap only. Remove the wires from the harness brackets on the valve rocker arm covers. Remove the distributor cap and spark plug wire assembly.
5. Remove the carburetor fuel inlet line and the automatic choke heat tube.
6. Disconnect the distributor vacuum line (if so equipped) at the carburetor. Remove the distributor hold down bolt and remove the distributor.
7. Disconnect the radiator upper hose at the coolant outlet housing, and the water temperature sending unit wire at the sending unit. Remove the heater hose from the automatic choke housing and disconnect the hose at the intake manifold.
8. Loosen the clamp on the water pump bypass hose at the coolant outlet housing and slide the hose off the outlet housing.
9. Disconnect the crankcase vent hose at the valve rocker arm cover.
10. If equipped with Thermactor exhaust emission control system, remove the air pump to left air manifold hose at the air pump and position it out of the way.

Remove the air hose at the valve. Remove the air hose bracket from the right valve rocker arm cover and position the air hose out of the way.

11. If the car is equipped with an air conditioner, remove the compressor to intake manifold brackets.
12. Remove the intake manifold

and carburetor as an assembly. It may be necessary to pry the intake manifold away from the cylinder heads, but be careful not to damage the gasket sealing surfaces. Remove the intake manifold gaskets and seals. Discard the intake manifold retaining bolt sealing washers.

13. If the manifold is to be disassembled, remove the coolant outlet housing, gasket and thermostat. Remove the ignition coil, temperature sending unit, carburetor, spacer and gaskets.

If equipped with Thermactor exhaust emission control system, remove the backfire-suppressor valve and bracket.

CLEANING AND INSPECTION

Refer to Part 8-1, Section 3 for the cleaning and inspection procedures.

INSTALLATION

Intake manifold alignment tools are required when installing the intake manifold on the cylinder block and cylinder heads. Fabricate two alignment tools according to the specifications shown in Fig. 26.

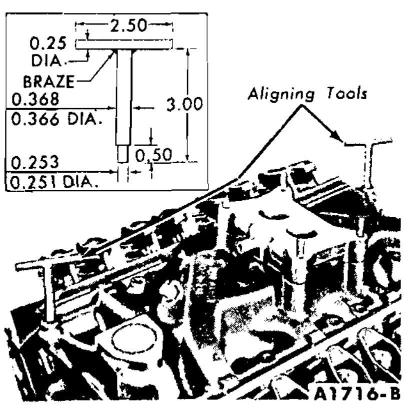


FIG. 26—Intake Manifold Alignment

1. If the intake manifold assembly was disassembled, install the temperature sending unit (threads coated with electrical conductive sealer), ignition coil, carburetor, spacer and gaskets. Position the thermostat in the coolant outlet housing. Coat the thermostat gasket with water-resistant sealer and position it on the coolant outlet housing. Install the coolant outlet housing, thermostat and gasket assembly.

If equipped with Thermactor exhaust emission control system, install the backfire-suppressor valve and bracket.

2. Clean the mating surfaces of the intake manifold, cylinder heads and cylinder block. Use a suitable solvent to remove all traces of oil. Coat the cylinder block seal surfaces with quick-drying adhesive sealer.

3. Position new seals on the cylinder block and new gaskets on the cylinder heads with the gaskets interlocked with the seal tabs. Be sure the holes in the gaskets are aligned with the holes in the cylinder heads.

Apply non-hardening sealer at the four junction points of the gaskets and seals.

4. Carefully lower the intake manifold into position on the cylinder block and cylinder heads. **After the intake manifold is in place, run a finger around the seal area to make sure the seals are in place. If the seals are not in place, remove the intake manifold and position the seals.**

5. Be sure the holes in the manifold gaskets and manifold are in alignment. Position the intake manifold alignment tools (Fig. 26) in the front and rear bolt holes (Nos. 10 and 12) on the left bank of the manifold.

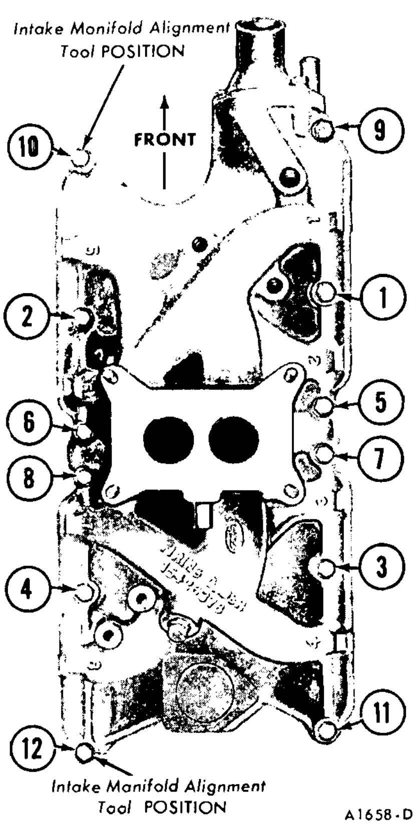


FIG. 27—Intake Manifold Torque Sequence

6. Using new sealing washers, install the intake manifold retaining bolts. Torque the bolts in two steps. First, torque the bolts in sequence (Fig. 27) to specifications.

7. Remove the manifold alignment tools from the front and rear bolt holes (Nos. 10 and 12). Using new sealing washers, install the two remaining bolts and torque to specifications.

8. Then, torque all the manifold retaining bolts in sequence to specifications.

9. Install the water pump by-pass hose on the coolant outlet housing. Slide the clamp into position and tighten the clamp.

10. Connect the radiator upper hose. Install the heater hose against the automatic choke housing and connect the hose at the intake manifold.

11. Install the carburetor fuel inlet line and the automatic choke heat tube.

12. Rotate the crankshaft damper until the No. 1 piston is on TDC at the end of the compression stroke. Position the distributor in the block with the rotor at the No. 1 firing position and the points open. Install the hold down clamp.

13. Install the distributor cap. Position the spark plug wires in the harness brackets on the valve rocker arm covers, and connect the spark plug wires.

14. Connect the crankcase vent hose. Connect the high tension lead and coil wires.

15. Connect the accelerator rod and retracting spring.

On a vehicle equipped with vacuum operated accessories, connect any vacuum lines that were disconnected from the intake manifold during removal.

On a vehicle with air conditioning, install the compressor to intake manifold brackets.

16. If equipped with Thermactor exhaust emission control system, connect the hose from the left air manifold to the air pump, connect the air hose to the backfire-suppressor valve and install the air hose bracket on the right valve rocker arm cover.

17. Fill and bleed the cooling system.

18. Start the engine and check and adjust the ignition timing. Connect the distributor vacuum line at the carburetor.

19. Operate the engine at fast idle and check all hose connections and gaskets for leaks. Operate the engine until engine temperatures have stabilized and adjust the engine idle speed and idle fuel mixture.

20. Connect the automatic choke heat chamber air inlet hose.

21. Install the air cleaner and intake duct assembly.

EXHAUST MANIFOLDS

REMOVAL

1. On a right exhaust manifold, disconnect the automatic choke heat chamber air inlet hose at the inlet tube near the right valve rocker arm cover.

Remove the automatic choke heat tube from the right exhaust manifold.

2. Remove the air cleaner and intake duct assembly.
3. Disconnect the exhaust manifold at the muffler inlet pipe.
4. Remove the retaining bolts and tab washers and remove the exhaust manifold.

CLEANING AND INSPECTION

Refer to Part 8-1, Section 3 for the cleaning and inspection procedures.

INSTALLATION

1. Clean the mating surfaces of the exhaust manifold and cylinder head. Clean the mounting flange of the exhaust manifold and muffler inlet pipe.
2. Apply graphite grease to the mating surface of the exhaust manifold.
3. Position the exhaust manifold on the cylinder head and install the retaining bolts and tab washers. Working from the center to the ends, torque the bolts to specifications. Lock the bolts by bending one tab of the washer over a flat on the bolt.
4. Place new gaskets on the muffler inlet pipe. Position the muffler inlet pipe to the manifold. Install and torque the retaining nuts to specifications.
5. Install the automatic choke heat tube on the right exhaust manifold. Install the air cleaner and intake duct assembly.
6. Connect the automatic choke heat chamber air inlet hose.
7. Start the engine and check for exhaust leaks.

POSITIVE CRANKCASE VENTILATION SYSTEM

The positive crankcase ventilation system components are shown in Fig. 28.

REMOVAL

1. On a closed ventilation system, remove the ventilation system air intake hose from the air cleaner and the oil filler cap.
2. Remove the air cleaner and intake duct assembly.
3. Disconnect the crankcase vent hose at the carburetor spacer, regulator valve and hot idle compensator (if so equipped).
4. Pull the regulator valve out of the valve rocker arm cover mounting grommet.

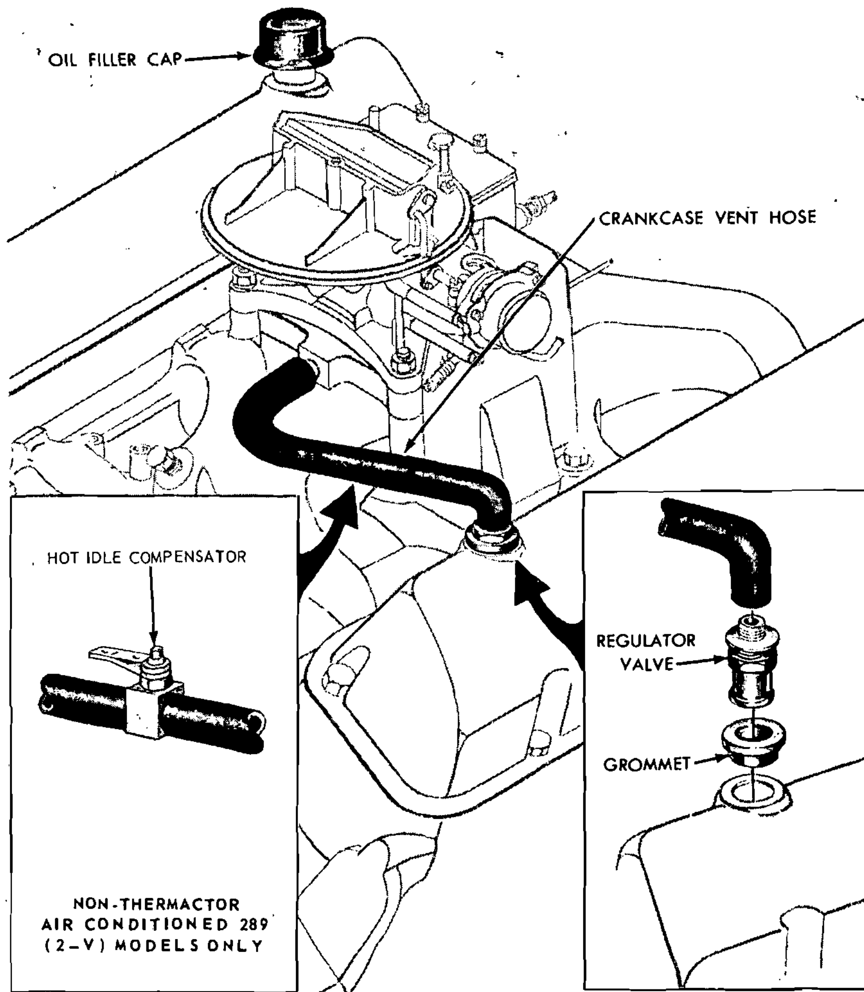


FIG. 28—**Positive Crankcase Ventilation System Components**

INSTALLATION

1. Insert the regulator valve into the valve rocker arm cover mounting grommet.
2. Connect the vent hose to the carburetor spacer regulator valve and hot idle compensator (if so equipped).
3. Install the air cleaner and intake duct assembly.
4. On a closed ventilation system, install the closed ventilation system air intake hose to the air cleaner and the oil filler cap.
5. Operate the engine and check for leaks.

CLEANING AND INSPECTION

Refer to Part 8-1, Section 3 for the cleaning and inspection procedures.

TESTING

Refer to Part 8-1, Section 1 for the test procedures.

CYLINDER HEADS

If a cylinder head is to be replaced, follow the procedures under Cylinder Head Disassembly and Assembly, and transfer all valves, springs, spark plugs, etc., to the new cylinder head. Clean and inspect all parts, reface the valves (refer to Part 8-1) and check all assembly clearances before assembling the new or used parts to the new cylinder head.

REMOVAL

1. Remove the intake manifold and carburetor as an assembly fol-

lowing the procedure under Intake Manifold Removal.

2. Disconnect the battery ground cable at the cylinder head.

If the left cylinder head is to be removed, on a vehicle with an air conditioner, isolate and remove the compressor as outlined in Group 15.

If the left cylinder head is to be removed, on a vehicle with power steering, disconnect the power steering pump bracket from the left cylinder head and remove the drive belt from the pump pulley. Wire the power steering pump out of the way and in a position that will prevent the oil from draining out.

If the left cylinder head is to be removed on an engine with Thermactor exhaust emission control system, disconnect the hose from the check valve attached to the air supply tube assembly.

3. If the right cylinder head is to be removed, remove the alternator mounting bracket bolt and spacer, ignition coil and air cleaner inlet duct from the right cylinder head assembly.

If the right cylinder head is to be removed on an engine with Thermactor exhaust control emission system, remove the air pump and bracket. Disconnect the hose from the check valve attached to the air supply tube assembly.

4. Disconnect the exhaust manifold(s) at the muffler inlet pipe(s).

Remove the rocker arm covers. If the right rocker arm cover is to be removed on an engine equipped with a thermactor exhaust emission control system, remove the check valve from the air manifold.

5. Loosen the rocker arm stud nuts so that the rocker arms can be rotated to the side. Remove the push rods in sequence (Fig. 29) so that they may be installed in their original positions.

6. Install the cylinder head holding fixtures (Fig. 30). Remove the cylinder head retaining bolts and lift the cylinder head off the block. Remove and discard the cylinder head gasket.

INSTALLATION

1. Clean the cylinder head, intake manifold, valve rocker arm cover and cylinder block gasket surfaces. If the cylinder head was removed for a cylinder head gasket replacement, check the flatness of the cylinder head and block gasket surfaces.

2. Position the new cylinder head gasket over the cylinder dowels on the block. Position the cylinder head on the block and install the retaining bolts. Remove the holding fixtures.

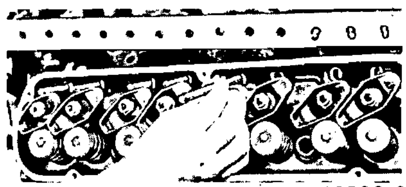


FIG. 29—Valve Push Rod Removal

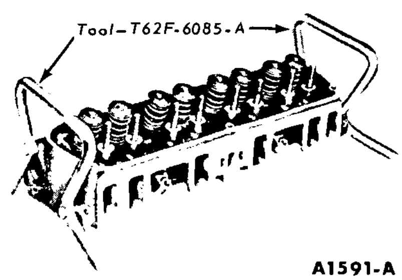


FIG 30—Cylinder Head Holding Fixtures.

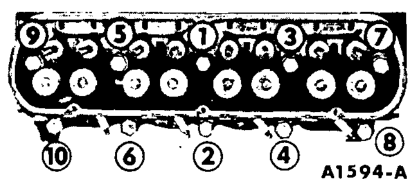


FIG. 31—Cylinder Head Bolt Torque Sequence

3. The cylinder head bolts are tightened in three progressive steps. Torque all the bolts in sequence (Fig. 31) to 50 ft-lbs., then to 60 ft-lbs., and finally to specifications. When cylinder head bolts have been tightened following this procedure, it is not necessary to retorque the bolts after extended operation. However, the bolts may be checked and retorqued, if desired.

4. Clean the push rods in a suitable solvent. Blow out the oil passage in the push rod with compressed air. Check the ends of the push rods for nicks, grooves, roughness or excessive wear. Visually check the push rods for straightness or check push rod runout with a dial indicator. If runout exceeds the maximum limit at any point, discard the rod. **Do not attempt to straighten push rods.**

5. Install the push rods in their original positions. Apply Lubriplate to the valve stem tips.

6. Apply Lubriplate to the fulcrum seat and socket and install the rocker arms. Perform a valve clearance adjustment as outlined in Part 8-1, Section 2.

7. Position a new gasket(s) on the muffler inlet pipe(s). Connect the exhaust manifold(s). Connect the exhaust manifold(s) at the muffler inlet pipe(s). Torque the nuts to specifications.

8. If the right cylinder head was removed, install the alternator retaining bolt and spacer, ignition coil and air cleaner inlet duct on the right cylinder head assembly. Adjust the drive belt tension to specifications.

9. Apply oil-resistant sealer to one side of new cover gaskets. Lay the cemented side of the gaskets in place in the cover(s). Install the valve rocker arm cover(s).

If the right cylinder head was removed on an engine equipped with Thermactor exhaust emission control system, connect the hose to the check valve attached to the air supply tube assembly. Install the air pump and alternator.

If the left cylinder head was removed, on a vehicle with an air conditioner, install the compressor as outlined in Group 15.

If the left cylinder head was removed, on a vehicle with power steering, install the drive belt and power steering pump bracket. Install the bracket retaining bolts. Adjust the drive belt to specifications.

10. Install the intake manifold and related parts following the procedure under Intake Manifold Installation.

11. If the left cylinder head was removed on an engine euqipped with Thermactor exhaust emission control system, connect the hose to the air check valve attached to the air supply tube assembly.

DISASSEMBLY

1. Remove the exhaust manifolds and the spark plugs.

2. On engines equipped with Thermactor, remove the air supply tube assembly.

3. Clean the carbon out of the cylinder head combustion chambers before removing the valves.

4. Compress the valve springs (Fig. 32). Remove the spring retainer locks and release the spring.

5. Remove the spring retainer, spring, stem seal and valve. Discard valve stem seals. Identify all valve parts.

CLEANING AND INSPECTION

Refer to Part 8-1, Section 3 for the cleaning and inspection procedures.

REPAIRS

Cylinder head repair and rocker arm stud replacement precedures, and checks such as valve and valve

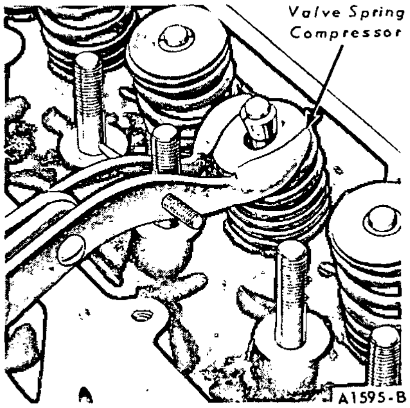


FIG. 32—Compressing Valve Spring—On Bench

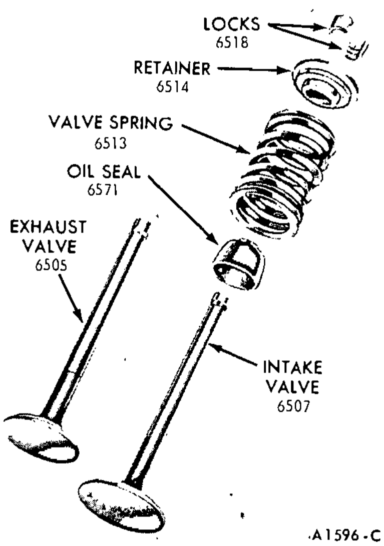


FIG. 33—Valve Assembly

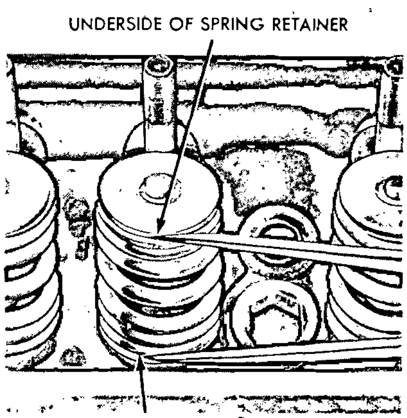


FIG. 34—Valve Spring Assembled Height

seat refacing, cylinder head flatness checks, etc., are covered in Part 8-1, Section 2.

ASSEMBLY

1. Install each valve (Fig. 33) in the port from which it was removed or to which it was fitted. Install a new stem seal on the valve.
2. Install the valve spring over the valve, and install the spring retainer. Compress the spring and install the retainer locks (Fig. 32).
3. Measure the assembled height of the valve spring from the surface of the cylinder head spring pad to the underside of the spring retainer with dividers (Fig. 34). Check the dividers against a scale. If the assembled height is greater than specifications, install the necessary 0.030-inch thick spacer(s) between the cylinder head spring pad and the valve spring to bring the assembled height to the recommended height.

Do not install the spacers unless necessary. Use of spacers in excess of recommendations will result in overstressing the valve springs and overloading the camshaft lobes which could lead to spring breakage and worn camshaft lobes.

4. On engines equipped with Thermactor, install the air supply tube assembly.
5. Install the exhaust manifolds and the spark plugs.

VALVE SPRING, RETAINER AND STEM SEAL REPLACEMENT

Broken valve springs, or defective valve stem seals and retainers may be replaced without removing the cylinder head, providing damage to the valve or valve seat has not occurred.

1. Disconnect the automatic choke heat chamber air inlet hose at the inlet tube near the right valve rocker arm cover.
2. Remove the air cleaner and intake duct assembly.

To remove the right valve rocker arm cover, remove the automatic choke heat tube. Remove the crankcase ventilation regulator valve from the valve rocker arm cover. If the engine is equipped with Thermactor exhaust emission control system, disconnect the backfire suppressor valve air line from the check valve and position it out of the way.

To remove the left valve rocker arm cover on an engine with Thermactor exhaust emission control system, disconnect the air hose from the left check valve.

3. Remove the valve rocker arm cover and the applicable spark plug.
4. Remove the valve rocker arm stud nuts, fulcrum seats, valve rocker arms and push rods from the applicable cylinder.
5. Install an air line with an adapter in the spark plug hole and turn on the air supply.
6. Install the stud nut and position the compressor tool as shown in Fig. 35. Compress the valve spring and remove the retainer locks, spring retainer and valve spring.
7. Remove and discard the valve stem seal (Fig. 36). **If air pressure fails to hold the valve in the closed position during this operation, it can be presumed that the valve is not seating or is damaged. If this condition occurs, remove the cylinder head for further inspection.**
8. **If air pressure has forced the piston to the bottom of the cylinder, any removal of air pressure will allow the valve(s) to fall into the cylinder. A rubber band, tape or string wrapped around the end of the valve stem will prevent this condition and will still allow enough travel to check the valve for binds.**

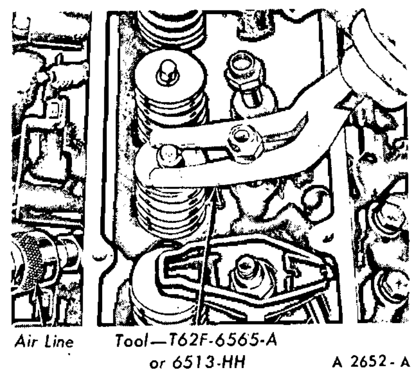


FIG. 35—Compressing Valve Spring—In Chassis

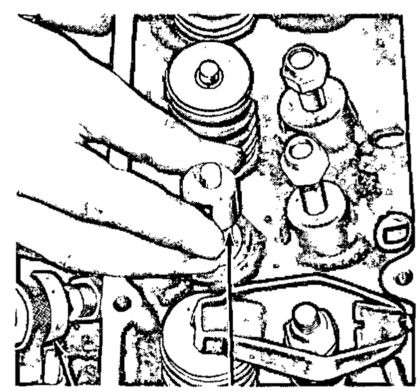


FIG. 36—Valve Stem Seal Removal or Installation

9. Inspect the valve stem for damage. Rotate the valve and check the valve stem tip for eccentric movement during rotation. Move the

valve up and down through normal travel in the valve guide and check the stem for binds. **If the valve has been damaged, it will be necessary to remove the cylinder head for repairs as outlined in Part 8-1, Section 2.**

10. If the condition of the valve proved satisfactory, hold the valve in the closed position and apply the air pressure within the cylinder.

11. Install a new valve stem seal (Fig. 30). Place the spring in position over the valve and install the valve spring retainer. Compress the valve spring and install the valve spring retainer locks. Remove the compressor tool and stud nut.

12. Install the push rod. Apply Lubriplate to the tip of the valve stem.

13. Apply Lubriplate to the fulcrum seat and socket and install the valve rocker arms fulcrum seats and stud nuts. Adjust the valve clearance following the procedure in Part 8-1, Section 2.

14. Turn off the air and remove the air line and adapter. Install the spark plug and connect the spark plug wire.

15. Clean and install the rocker arm cover.

If the right cover was removed install the automatic choke heat tube and the crankcase ventilation regulator valve. If the engine is equipped with Thermactor exhaust emission control system, connect the backfire suppressor valve air line.

If the left cover was removed on an engine with Thermactor exhaust emission control system, connect the air line to the check valve.

16. Install the air cleaner and intake duct assembly.

17. Connect the automatic choke heat chamber air inlet hose.

WATER PUMP

REMOVAL

1. Drain the cooling system.

On a vehicle with power steering, remove the power steering drive belt. Remove the power steering pump and bracket, as an assembly, and position to one side.

On a vehicle with an air conditioner, remove the compressor drive belt.

2. Disconnect the radiator lower hose and heater hose at the water pump. Loosen and remove the drive belt. Remove the fan, fan spacer or fan drive clutch and pulley.

3. Loosen the bypass hose clamp at the water pump.

4. Remove the bolts retaining the pump to the cylinder front cover. Remove the pump and gasket. Discard the gasket.

INSTALLATION

Before a water pump is re-installed, check it for damage. If it is damaged and requires repair, replace it with a new pump or install a rebuilt pump obtained from a Ford-Authorized Reconditioner.

1. Remove all gasket material from the mounting surfaces of the cylinder front cover and water pump.

2. Position a new gasket, coated on both sides with water-resistant sealer, on the cylinder front cover; then install the pump.

3. Install the retaining bolts and torque them to specifications.

On a vehicle with power steering, install the power steering pump and the drive belt and adjust the tension to specifications.

On a vehicle with an air conditioner, install the compressor drive belt and adjust the tension to specifications.

4. Install the pulley, spacer or fan drive clutch and fan. Install and adjust the drive belt to the specified belt tension. Connect the radiator hose and heater hose.

5. Fill and bleed the cooling system. Operate the engine until normal operating temperatures have been reached and check for leaks.

CYLINDER FRONT COVER AND TIMING CHAIN

REMOVAL

1. Drain the cooling system and the crankcase.

2. Disconnect the radiator lower hose at the water pump.

3. Disconnect the heater hose at the water pump. Slide the water pump bypass hose clamp toward the water pump.

4. Loosen the alternator to cylinder head mounting bolt. Remove the alternator bracket bolts at the water pump and position the alternator and brackets out of the way.

If the engine is equipped with a Thermactor exhaust emission control system, remove the air pump and brackets.

5. On a vehicle with power steering and/or air conditioning, loosen the drive belt tension and remove the belt(s).

6. Remove the fan, spacer, pulley and drive belt.

7. Remove the crankshaft pulley from the crankshaft vibration damper. Remove the damper retaining screw and washer. Install the puller on the crankshaft vibration damper (Fig. 37) and remove the vibration damper.

8. Disconnect the fuel pump outlet line at the fuel pump. Remove the fuel pump retaining bolts and lay the pump to one side with the flexible fuel line still attached.

9. Remove the oil level dipstick.

10. Remove the oil pan to cylinder front cover retaining bolts. Remove the cylinder front cover and water pump as an assembly.

If a new cylinder front cover is to be installed, remove the water pump and dipstick tube from the old cylinder front cover and install them on the new cover.

11. Discard the cylinder front cover gasket. Remove the crankshaft front oil slinger.

12. Check the timing chain deflection (refer to Part 8-1, Section 2).

13. Crank the engine until the timing marks on the sprockets are positioned as shown in Fig. 38.

14. Remove the camshaft sprocket cap screw, washers and fuel pump eccentric. Slide both sprockets and the timing chain forward, and remove them as an assembly (Fig. 39).

15. Remove the oil pan and oil pump pickup tube by following the procedure under Oil Pan Removal.

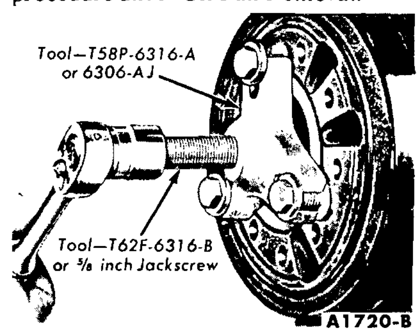


FIG. 37—Crankshaft Vibration Damper Removal

CLEANING AND INSPECTION

Refer to Part 8-1, Section 3 for the cleaning and inspection procedures. Clean the crankshaft damper, following the referenced procedure.

FRONT OIL SEAL REPLACEMENT

It is good practice to replace the oil seal each time the cylinder front cover is removed.

1. Drive out the old seal with a pin punch. Clean out the recess in the cover.

2. Coat a new seal with grease; then install the seal in the cover (Fig. 40). Drive the seal in until it is fully seated in the recess. Check the seal after installation to be sure the spring is properly positioned in the seal.

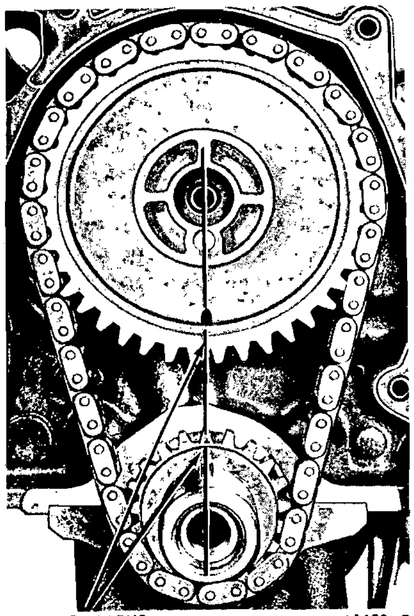


FIG. 38—Aligning Timing Marks

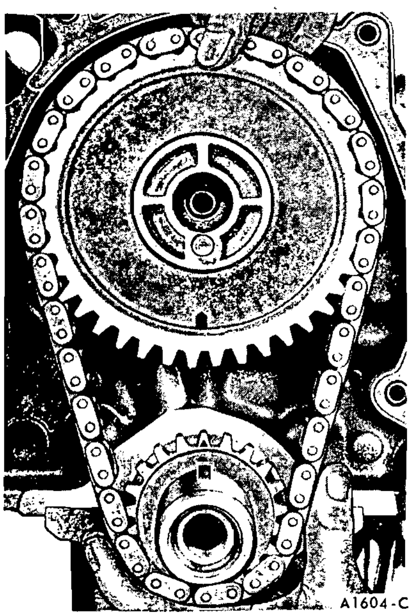


FIG. 39—Timing Chain Removal or Installation

INSTALLATION

1. Position the sprockets and timing chain on the camshaft (Fig. 39). Be sure the timing marks on the sprockets are positioned as shown in Fig. 38.
2. Install the fuel pump eccentric, washers and camshaft sprocket cap screw. Torque the sprocket cap screw to specifications. Install the crankshaft front oil slinger (Fig. 41).

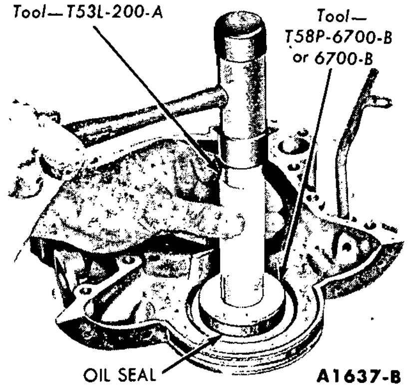


FIG. 40—Crankshaft Front Oil Seal Replacement

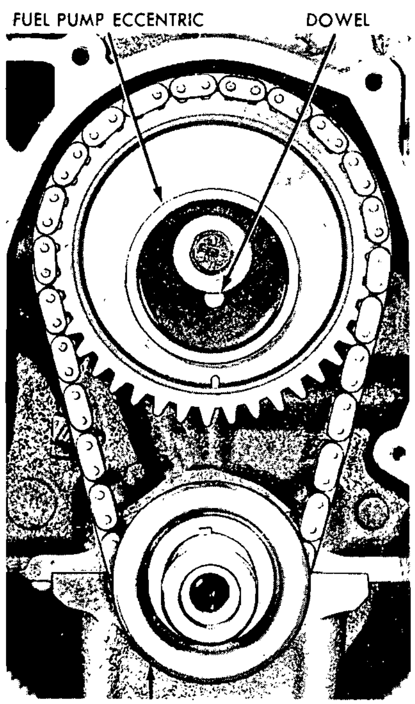


FIG. 41—Fuel Pump Eccentric and Front Oil Slinger Installed

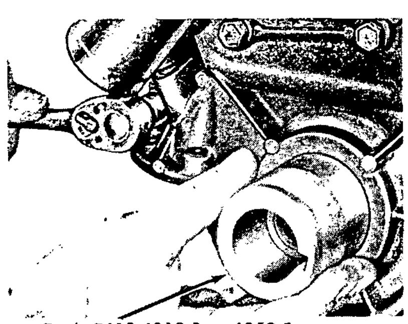


FIG. 42—Cylinder Front Cover Alignment

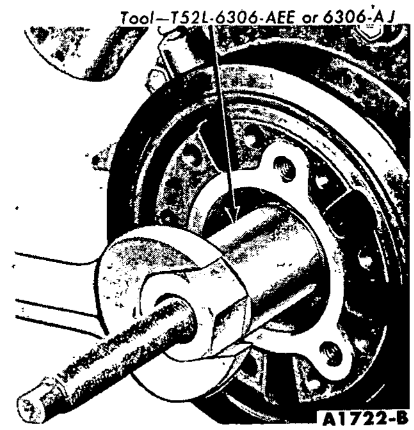


FIG. 43—Crankshaft Vibration Damper Installation

3. Clean the cylinder front cover, oil pan and the block gasket surfaces.
4. Lubricate the timing chain with engine oil.
5. Coat the gasket surfaces of the block and cover and sealer. Position a new gasket on the block.
6. Install the alignment pilot tool on the cylinder front cover so that the keyway in the pilot aligns with the key in the crankshaft. Position the cover and pilot over the end of the crankshaft and against the block (Fig. 42). Coat the threads of the retaining screws with oil-resistant sealer and install the screws. While pushing in on the pilot, torque the screws to specifications. Remove the pilot.
7. Apply Lubriplate to the oil seal rubbing surface of the vibration damper inner hub to prevent damage to the seal. Apply a white lead and oil mixture to the front of the crankshaft damper for installation.
8. Line up the crankshaft vibration damper keyway with the key on the crankshaft. Install the vibration damper on the crankshaft (Fig. 43). Install the cap screw and washer. Torque the screw to specifications. Install the crankshaft pulley.
9. Install the oil pump pickup tube and oil pan following the procedure under Oil Pan Installation.
10. Install the fuel pump using a new gasket. Connect the fuel pump outlet pipe.
11. Install the water pump pulley, drive belt, spacer and fan.
12. On an engine equipped with Thermactor exhaust emission control system, install the air pump and brackets.
13. Install the alternator bracket. Adjust the drive belt tension to specifications and tighten the alternator mounting bolts.

14. Connect the heater hose and the water pump bypass hose. Slide the bypass hose clamp into position.

15. Connect the radiator hose.

16. On a vehicle with power steering and/or air conditioning, install and adjust the drive belts.

17. Fill and bleed the cooling system. Fill the crankcase with the proper grade and quantity of engine oil.

18. Operate the engine at fast idle and check for coolant and oil leaks. Check and adjust the ignition timing.

CAMSHAFT

The camshaft and related parts are shown in Fig. 44.

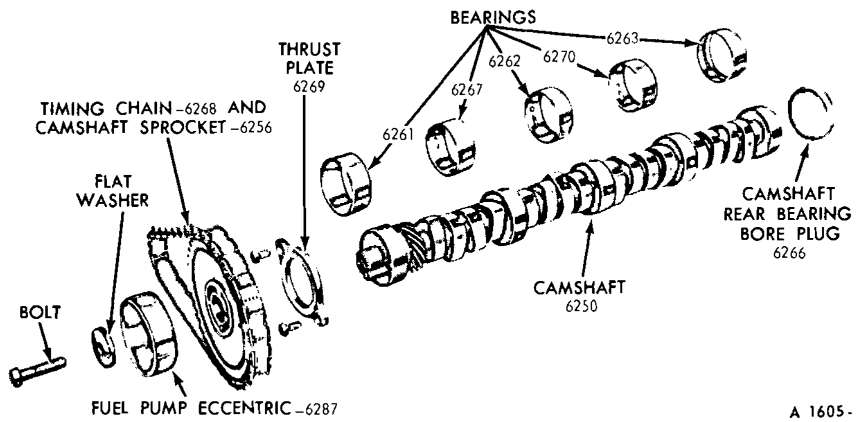


FIG. 44—Camshaft and Related Parts

REMOVAL

1. Remove the cylinder front cover and the timing chain following the procedure under Cylinder Front Cover and Timing Chain Removal.

2. Disconnect the spark plug wires at the spark plugs and remove the wires from the ignition harness brackets on the valve rocker arm covers. Disconnect the coil high tension lead at the coil. Remove the distributor cap and spark plug wire assembly.

3. Disconnect the ignition coil wires at the coil.

4. Disconnect the distributor vacuum line at the carburetor. Remove the distributor hold down bolt and clamp and remove the distributor.

5. Disconnect the automatic choke heat tube at the carburetor. Remove the heater hose from the automatic choke and disconnect the hose at the intake manifold.

On a vehicle with an automatic transmission, disconnect the throttle valve vacuum line at the intake manifold. Disconnect the transmission oil cooler lines at the radiator.

6. Disconnect the radiator upper hose and remove the radiator.

7. Disconnect the accelerator rod at the carburetor. Remove the accelerator retracting spring.

8. Disconnect the water temperature sending unit wire at the sending unit and the engine ground strap at the engine.

9. Remove the crankcase ventilation regulator valve from the valve rocker arm cover.

10. On engines equipped with Thermactor, disconnect the backfire suppressor valve air lines from the check valves. Remove the valve rocker arm covers. Loosen the valve rocker arm stud nuts and rotate the rocker arms to the side.

11. Remove the intake manifold and carburetor as an assembly, following the procedure under Intake Manifold Removal. Remove the intake manifold gaskets and seals.

12. Remove the valve push rods in sequence so that they can be installed in their original positions.

13. Using a magnet, remove the valve lifters and place them in a rack so that they can be installed in their original bores (Fig. 45).

If the valve lifters are stuck in their bores by excessive varnish, etc. it may be necessary to use a plier-type tool (T52T-6500-DJD or 6500-D) to remove the lifters. Rotate the lifter back and forth to loosen it from the gum or varnish that may have formed at the lifter.

14. Remove the camshaft thrust plate. Carefully remove the camshaft by pulling it toward the front of the engine. **Use caution to avoid damaging the camshaft bearings.**

CLEANING AND INSPECTION

Refer to Part 8-1, Section 3 for the cleaning and inspection procedures.

REPAIRS

Refer to Part 8-1, Section 2 for the repair procedures.

INSTALLATION

1. Oil the camshaft journals and apply Lubriplate to the lobes. Carefully slide the camshaft through the bearings. Install the camshaft thrust plate. Check camshaft end play following the procedures in Part 8-1, Section 1.

2. Install the valve lifters in the bores from which they were removed.

3. Install the push rods in their original position. Apply Lubriplate to the valve stem tips. Position the rocker arms over the push rods.

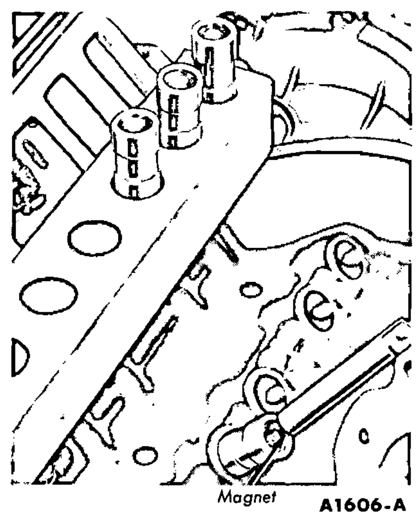


FIG. 45—Valve Lifter Removal

4. Install the intake manifold and related parts by following steps 1 thru 8 under Intake Manifold Installation.

5. Connect the water temperature sending unit and the engine ground strap.

6. Connect the accelerator rod and accelerator retracting spring.

7. Install the radiator.

On a car with an automatic transmission, connect the transmission oil cooler lines and throttle valve vacuum line.

8. Connect the heater hose at the intake manifold. Position and connect the fuel line.

9. Replace the crankshaft front oil seal. Install the timing chain, cylinder front cover and related parts following steps 1 thru 16 under Cylinder Front Cover and Timing Chain Installation.

10. With No. 1 piston on TDC

at the end of the compression stroke, position the distributor in the block with the rotor at the No. 1 firing position and the points open. Install the hold down clamp.

11. Perform a valve clearance adjustment as outlined in Part 8-1, Section 2.

12. Clean the valve rocker arm covers and the cylinder head gasket surface. Apply oil-resistance sealer to one side of new cover gaskets. Lay the cemented side of the gaskets in place in the covers.

13. Position the covers on the cylinder heads. Make sure the gasket seats evenly all around the head. Install the bolts. The cover is tightened in two steps. Torque the bolts to specifications. Two minutes later, torque the bolts to the same specifications.

14. Clean and install the crankcase ventilation system.

15. On engines equipped with Thermactor, connect the backfire suppressor valve air lines to the check valves.

16. Install the automatic choke heat tube. Connect the ignition coil wires.

17. Install the distributor cap. Position the spark plug wires in the harness brackets on the valve rocker arm covers and connect the spark plug wires. Connect the high tension lead at the coil.

18. Fill and bleed the cooling system. Fill the crankcase with the proper grade and quantity of engine oil.

19. Start the engine and check and adjust the ignition timing. Connect the distributor vacuum line at the carburetor.

20. Operate the engine at fast idle and check all hose connections and gaskets for leaks. Operate the engine until engine temperatures have stabilized and adjust the engine idle speed and idle fuel mixture.

21. Adjust the transmission throttle linkage. Install the air cleaner and intake duct assembly.

22. Connect the automatic choke heat chamber air inlet hose.

CAMSHAFT REAR BEARING BORE PLUG REPLACEMENT

1. On a vehicle with a manual-shift transmission, remove the transmission, clutch pressure plate and disc following the procedures in Group 5.

On a vehicle with an automatic transmission, remove the transmission and converter housing following the procedure in Group 7.

2. Remove the flywheel retaining bolts and remove the flywheel. Remove the engine rear cover plate.

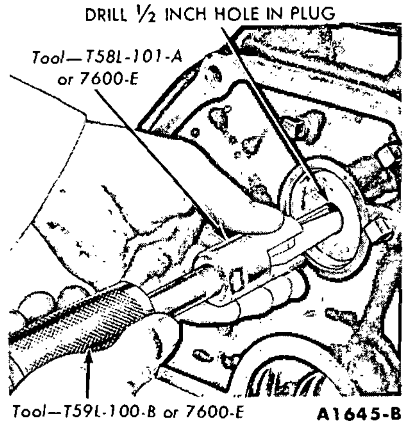


FIG. 46—Camshaft Rear Bearing Bore Plug Removal

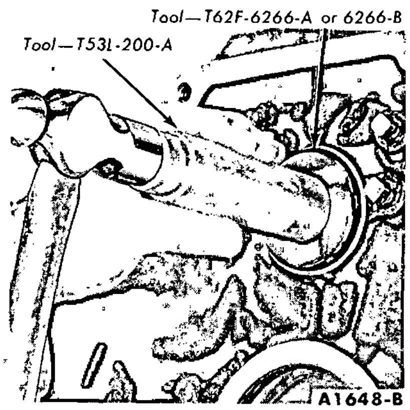


FIG. 47—Camshaft Rear Bearing Bore Plug Installation

3. Drill a 1/2-inch hole in the camshaft rear bearing bore plug and remove the plug using the tools shown in Fig. 46.

4. Clean out the plug bore recess thoroughly and coat the flange of a new plug with oil-resistant sealer. Install the new plug with the flange facing outward. Drive the plug in until it is slightly below the chamfer in the bore (Fig. 47).

5. Coat the flywheel retaining bolts with oil-resistant sealer. Position the engine rear cover plate on the cylinder block dowels. Position the flywheel on the crankshaft flange. Install and torque the retaining bolts in sequence across from each other to specifications.

On a vehicle with a manual-shift transmission, install the clutch pressure plate, disc and the transmission following the procedures in Group 5.

On a vehicle with an automatic transmission, install the transmission and converter housing following the procedure in Group 7.

VALVE LIFTER REPLACEMENT

REMOVAL

1. Remove the intake manifold and related parts by following steps 1 thru 12 under Intake Manifold Removal.

2. Remove the crankcase ventilation regulator valve from the valve rocker arm cover.

3. On engines equipped with Thermactor, remove the backfire suppressor valve air lines from the check valves. Remove the valve rocker arm covers. Loosen the valve rocker arm stud nuts and rotate the rocker arms to the side.

4. Remove the valve push rods in sequence so that they can be installed in their original positions.

5. Using a magnet, remove the valve lifters and place them in a rack so that they can be installed in their original bores (Fig. 45).

If the valve lifters cannot be removed from their bores because of excessive varnish, etc., it may be necessary to use a plier-type tool (T52T-6500-DJD or 6500-D) to remove the lifters. Rotate the lifter back and forth to loosen it from the gum or varnish that may have formed at the lifter.

On hydraulic valve lifters, the internal parts of each lifter assembly are matched sets. Do not intermix the parts. Keep the assemblies intact until they are to be cleaned.

TESTING

Refer to Part 8-1, Section 1 for the testing procedures.

INSTALLATION

1. Clean and install the valve lifters in the bores from which they were removed. If a new lifter(s) is being installed, check the new lifter(s) for a free fit in the bore in which it is to be installed.

2. Install the push rods in their original position. Apply Lubriplate to the valve stem tips and the push rod guides in the cylinder head.

3. Position the rocker arms over the push rods. Perform a valve clearance adjustment as outlined in Part 8-1, Section 2.

4. Install the valve rocker arm covers. Install the crank case ventilation regulator valve in the valve rocker arm cover. Connect the backfire suppressor valve air lines to the check valves.

5. Install the intake manifold and related parts by following steps 2 thru 20 under Intake Manifold Installation.

VALVE LIFTER DISASSEMBLY

The disassembly and assembly procedures for Types I and II valve lifters are different. Valve lifters should always be tested after assembly; refer to the test procedures covered in Part 8-1, Section 1.

TYPE I

Disassembly

Each valve lifter is a matched assembly. If parts of one lifter are intermixed with those of another, improper valve operation may result. Disassemble and assemble each lifter separately. Keep the lifter assemblies in proper sequence so they can be installed in their original bores.

1. Grasp the lock ring with needle nose pliers to release it from the groove. It may be necessary to depress the plunger to fully release lock ring.
2. Remove the pushrod cup, metering valve (disc), plunger and spring.
3. Remove the plunger assembly, the check valve and the check valve retainer and plunger spring. Carefully remove the plunger spring, the check valve retainer and the check valve disc from the plunger.

Cleaning and Inspection

Refer to Part 8-1, Section 3 for the cleaning and inspection procedures.

Assembly

Type I hydraulic lifter assembly is shown in Fig. 48.

1. Place the plunger upside down on a clean work bench.
2. Place the check valve (disc or ball check) in position over the oil hole on the bottom of the plunger. Set the check valve spring on top of the check valve (disc or ball check).
3. Position the check valve retainer over the check valve and spring and push the retainer down into place on the plunger.
4. Place the plunger spring, and then the plunger (open end up) into the lifter body.
5. Position the metering valve (disc) in the plunger, and then place the push rod seat in the plunger.
6. Depress the plunger, and position the closed end of the lock ring in the groove of the lifter body. With the plunger still depressed, position the open ends of the lock ring in the groove. Release the plunger, and then depress it again to fully seat the lock ring.

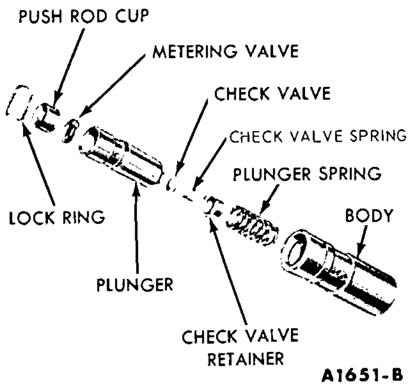


FIG. 48—Type I Hydraulic Valve Lifter Assembly

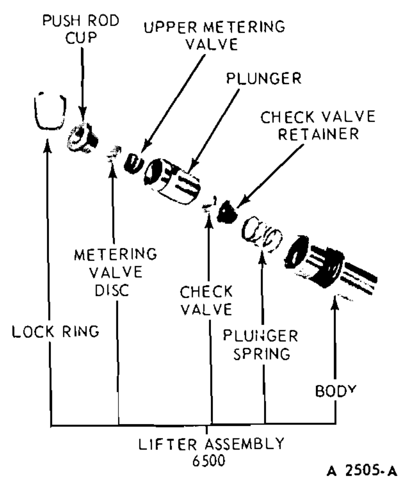


FIG. 49—Type II Hydraulic Valve Lifter Assembly

7. Use the hydraulic valve lifter leakdown tester (Part 8-1) to fill the lifters with test fluid.

TYPE II

Disassembly

Each valve lifter is a matched assembly. If parts of one lifter are intermixed with those of another, improper valve operation may result. Disassemble and assemble each lifter separately. Keep the lifter assemblies in proper sequence so they can be installed in their original bores.

1. Grasp the lock ring with needle nose pliers to release it from the groove. It may be necessary to depress the plunger to fully release lock ring.
2. Remove the push rod cup, metering valve disc, and the upper metering valve. **Do not bend the metering valve or the valve tensioning finger.**
3. Remove the plunger assembly, the check valve and the check valve retainer and plunger spring. Carefully remove the plunger spring, the check valve retainer and the check valve disc from the plunger.

Cleaning and Inspection

Refer to Part 8-1, Section 3 for the cleaning and inspection procedures.

Assembly

Type II hydraulic lifter assembly is shown in Fig. 49.

1. Place the plunger on a clean work surface (table or bench) in an upside down position and center the check valve disc on it. Carefully slide the check valve over the disc and down until it bottoms. A slight turning motion will help this. **Use every precaution not to distort it in anyway, or to bend the preformed fingers.** With a slight turning motion slide the plunger spring over the metering valve and down until it seats.
2. Leaving the assembly in this upside down position, slide the lifter body down over the spring until it slightly compresses the spring.
3. Position the combined assembly right side up on the work surface (table or bench).
4. Position the upper metering valve in the plunger taking care not to tilt it to either side, and not to damage or bend the valve tensioning finger. Place the metering valve disc over the metering valve and install the push rod cup. Depress the cup and install the lock ring.
5. Use the hydraulic valve lifter leakdown tester (Part 8-1) to fill the lifters with test fluid.

CRANKSHAFT REAR OIL SEAL REPLACEMENT

Replacement of a crankshaft rear oil seal because of oil leakage requires replacement of both the upper and lower seals. Remove the engine; then remove the crankshaft and replace the seals by following the procedure under Crankshaft Removal and Installation (Section 4).

MAIN AND CONNECTING ROD BEARING REPLACEMENT

The main and connecting rod bearing inserts are selective fit. **Do not file or lap bearing caps or use bearing shims to obtain the proper bearing clearance.**

Selective fit bearings are available for service in standard sizes and 0.002 inch undersize. Standard bearings are divided into two sizes and are identified by a daub of red or blue paint. Refer to the Parts Catalog for the available sizes. **Red marked bearings increase the clearance; blue marked bearings decrease the clear-**

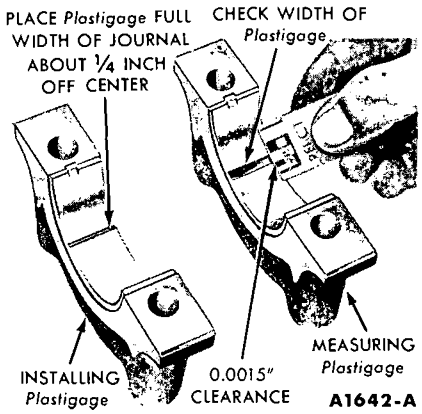


FIG. 50—Installing and Measuring Plastigage—Engine Installed

ance. Undersize bearings, which are not selective fit, are available for use on journals that have been refinished.

MAIN BEARING

1. Drain the crankcase. Remove the oil level dipstick. Remove the oil pan and related parts.
2. Remove the oil pump inlet tube assembly and the oil pump.
3. **Replace one bearing at a time, leaving the other bearings securely fastened.** Remove the main bearing cap to which new bearings are to be installed.
4. Insert the upper bearing removal tool (tool 6331) in the oil hole in the crankshaft.
5. Rotate the crankshaft in the direction of the engine rotation to force the bearing out of the block.
6. Clean the crankshaft journals. Inspect the journals and thrust faces (thrust bearing) for nicks, burrs or bearing pick-up that would cause premature bearing wear. **When replacing standard bearings with new bearings, it is good practice to fit the bearing to the minimum specified clearance and to first try to obtain the proper clearance with two blue bearing halves.**
7. To install the upper main bearing, place the plain end of the bearing over the shaft on the locking tang side of the block and partially install the bearing so that tool 6331 can be inserted in the oil hole in the crankshaft. With tool 6331 positioned in the oil hole in the crankshaft, rotate the crankshaft in the opposite direction of engine rotation until the bearing seats itself. Remove the tool.
8. Replace the cap bearing.
9. Support the crankshaft so that its weight will not compress the Plastigage and provide an erroneous reading. Position a jack so that it will bear against the counterweight adjoining the bearing which is being checked.
10. Place a piece of Plastigage on the bearing surface the full width of the bearing cap and about 1/4 inch off center (Fig. 50).
11. Install the cap and torque the bolts to specifications. **Do not turn the crankshaft while the Plastigage is in place.**
12. Remove the cap. Using the Plastigage scale, check the width of the Plastigage. When checking the width of the Plastigage, check at the widest point in order to get the minimum clearance. Check at the narrowest point in order to get the maximum clearance. The difference between the two readings is the taper of the journals.
13. If the clearance is less than the specified limits, try two red bearing halves or a combination of red and blue depending upon the condition.

If the clearance exceeds specified service limits, try 0.002 inch undersize bearings in combination with red or blue bearings. **The bearing clearance must be within specified limits.** If 0.002 undersize main bearings are used on more than one journal, be sure they are all installed in the cylinder block side of the bearing. If the standard and 0.002 inch undersize bearings do not bring the clearance within the desired limits, refinish the crankshaft journal, then install undersize bearings.

14. After the bearing has been fitted, apply a light coat of engine oil to the journal and bearings; then install the bearing cap. Torque the cap bolts to specifications.
15. Repeat the procedure for the remaining bearings that require replacement.
16. If the rear main bearing is to be replaced, remove the rear main bearing cap. Remove and discard the rear oil seal.
17. Clean the rear journal oil seal groove and the mating surfaces of the block and rear main bearing cap. Preform the new seal by hand to the approximate radius of the cap.
18. Insert the seal in the oil seal groove, seating the center of the seal first and allowing the seal to extend equally on both ends. Press the seal down firmly with the thumb at the center of the seal, then press both ends of the seal into the groove, working from the ends to the center.
19. Position the seal forming tool as shown in Fig. 51 and complete the seal installation. After installation, cut the ends of the seal flush.
20. Apply a thin coating of oil-resistant sealer to the rear main bearing cap at the rear of the top mating surface (Fig. 51.) **Do not apply sealer to the area forward of the oil slinger groove.** Install the rear main bearing cap and torque the cap bolts to specifications.

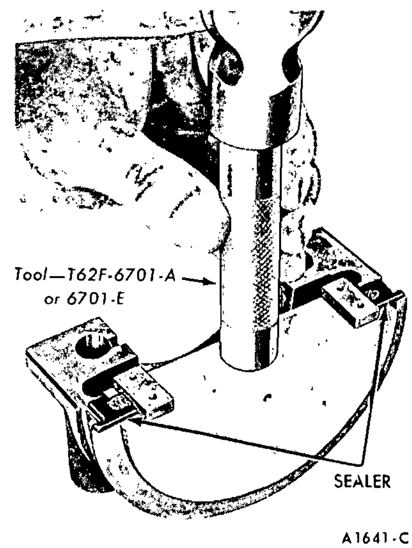


FIG. 51—Seal to Rear Bearing Cap Installation

21. If the thrust bearing cap (No. 3 main bearing) has been removed, install it as follows:

Install the thrust bearing cap with the bolts finger-tight. Pry the crankshaft forward against the thrust surface of the upper half of the bearing (Fig. 52). Hold the crankshaft forward and pry the thrust bearing cap to the rear (Fig. 52). This will align the thrust surfaces of both halves of the bearing. Retain the forward pressure on the crankshaft. Torque the cap bolts to specifications (Fig. 52).

22. Clean the oil pump inlet tube screen. Prime the oil pump by filling the inlet opening with oil and rotate the pump shaft until oil emerges from the outlet opening. Install the oil pump and the inlet tube assembly.
23. Position the oil pan gaskets on the oil pan. Position the oil pan front seal on the cylinder front cover. Position the oil pan rear seal on the rear main bearing cap. Install the oil pan and related parts. Install the oil level dipstick.
24. Fill the crankcase. Start the engine and check for oil pressure. Operate the engine at fast idle and check for oil leaks.

CONNECTING ROD BEARING

1. Follow steps 1 and 2 under Main Bearing Replacement.
2. Turn the crankshaft until the

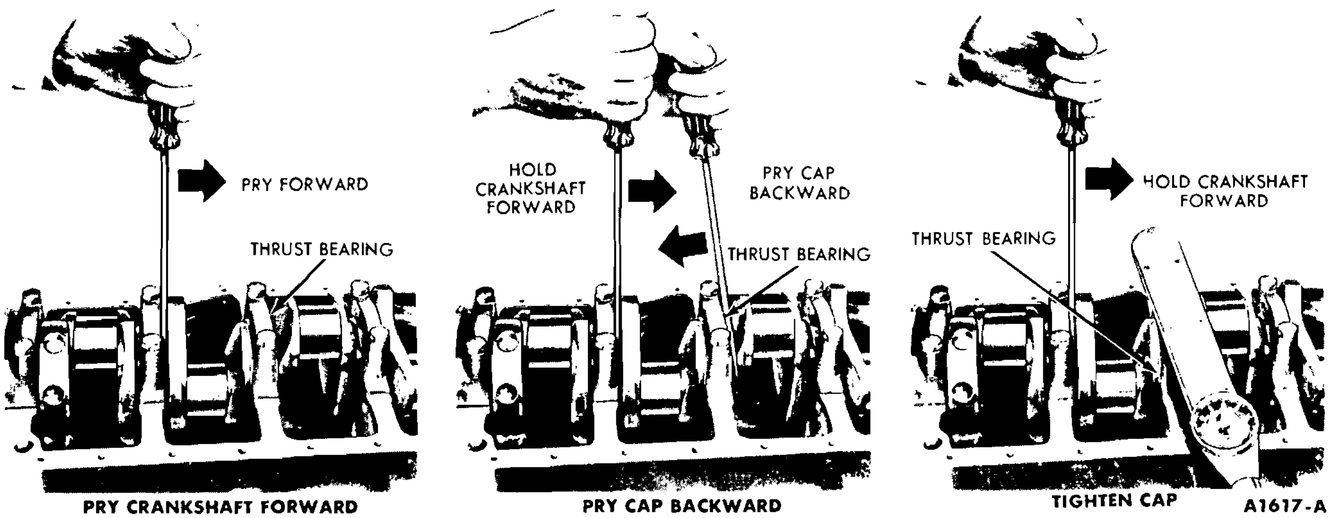


FIG. 52—Thrust Bearing Alignment

connecting rod to which new bearings are to be fitted is down. Remove the connecting rod cap. Remove the bearing inserts from the rod and cap.

3. Be sure the bearing inserts and the bearing bore in the connecting rod and cap are clean. Foreign material under the inserts will distort the bearing and cause a failure.

4. Clean the crankshaft journal. **When replacing standard bearings with new bearings, it is good practice to fit the bearing to the minimum specified clearance and to first try to obtain the proper clearance with two blue bearing halves.**

5. Install the bearing inserts in the connecting rod and cap with the tangs fitting in the slots provided.

6. Pull the connecting rod assembly down firmly on the crankshaft journal.

7. Place a piece of Plastigage on the lower bearing surface, the full width of the cap and about 1/4 inch off-center.

8. Install the cap and torque the connecting rod nuts to specifications. **Do not turn the crankshaft while the Plastigage is in place.**

9. Refer to steps 12 and 13 under Main Bearing Replacement.

10. After the bearing has been fitted, clean and apply a light coat of engine oil to the journal and bearings. Install the connecting rod cap. Torque the nuts to specifications.

11. Repeat the procedure for the remaining connecting rods that require new bearings.

12. Follow steps 22 thru 24 under Main Bearing Replacement.

CLEANING AND INSPECTION

Refer to Part 8-1, Section 3 for the cleaning and inspecting procedures.

PISTONS AND CONNECTING RODS

REMOVAL

1. Drain the cooling system and the crankcase. Remove the intake manifold, cylinder heads, oil pan and oil pump following the procedures in this section.

2. Remove any ridge and/or deposits from the upper end of the cylinder bores as follows:

Turn the crankshaft until the piston to be removed is at the bottom of its travel and place a cloth on the piston head to collect the cuttings. Remove any ridge and/or deposits from the upper end of the cylinder bores. Remove the cylinder ridge with a ridge cutter. Follow the instructions furnished by the tool manufacturer. **Never cut into the ring travel area in excess of 1/32 inch when removing ridges.**

3. Make sure all connecting rod caps are marked so that they can be installed in their original positions.

4. Turn the crankshaft until the connecting rod being removed is down.

5. Remove the connecting rod nuts and cap.

6. Push the connecting rod and piston assembly out the top of the cylinder with the handle end of a hammer. **Avoid damage to the crankshaft journal or the cylinder wall when removing the piston and rod.**

7. Remove the bearing inserts from the connecting rod and cap.

8. Install the cap on the connecting rod from which it was removed.

INSTALLATION

1. If new piston rings are to be installed, remove the cylinder wall glaze. Follow the instructions of the tool manufacturer.

2. Oil the piston rings, pistons and cylinder walls with light engine oil. **Be sure to install the pistons in the same cylinders from which they were removed or to which they were fitted. The connecting rod and bearing caps are numbered from 1 to 4 in the right bank and from 5 to 8 in the left bank, beginning at the front of the engine. The numbers on the connecting rod and bearing cap must be on the same side when installed in the cylinder bore. If a connecting rod is ever transposed from one block or cylinder to another, new bearings should be fitted and the connecting rod should be numbered to correspond with the new cylinder number.**

3. Make sure the ring gaps are properly spaced around the circumference of the piston (Fig. 53).

4. Install a piston ring compressor on the piston and push the piston in with a hammer handle until it is slightly below the top of the cylinder (Fig. 54). Be sure to guide the connecting rods to avoid damaging the crankshaft journals. **Install the piston with the indentation notch in the piston head toward the front of the engine.**

5. Check the clearance of each bearing following the procedure under Connecting Rod Bearing Replacement.

6. After the bearings have been fitted, apply a light coat of engine oil to the journals and bearings.

7. Turn the crankshaft throw to the bottom of its stroke. Push the piston all the way down until the connecting rod bearing seats on the crankshaft journal.

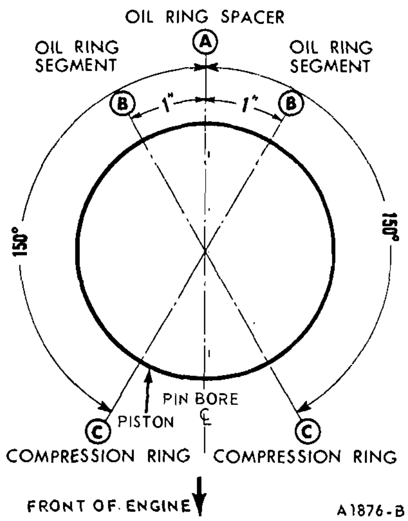


FIG. 53—Piston Ring Spacing

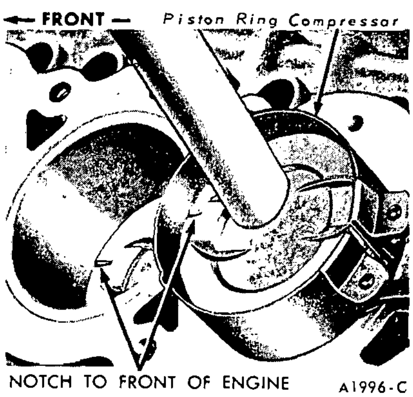


FIG. 54—Piston Installation

FIG. 55—Connecting Rod Side Clearance

8. Install the connecting rod cap. The high performance engine uses 3/8-inch-diameter connecting rod bolts. **The bolts must be installed with the flat on the outside of the connecting rod. If improperly installed, the bolt will loosen and eventually fail.** Torque the nuts to specifications.

9. After the piston and connecting rod assemblies have been installed, check the side clearance between the connecting rods on each crankshaft journal (Fig. 55).

10. Disassemble, clean and assemble the oil pump. Clean the oil pump inlet tube screen, and the oil pan and block gasket surfaces.

11. Prime the oil pump by filling either the inlet port or outlet port with engine oil and rotating the pump shaft to distribute the oil within the housing. Install the oil pump and the oil pan.

12. Install the cylinder heads following steps 1 thru 9 under Cylinder Head Installation.

13. Install the intake manifold following steps 2 thru 15 under Intake Manifold Installation.

14. Fill and bleed the cooling system. Fill the crankcase with the proper grade and quantity of engine oil.

15. Start the engine and check and adjust the ignition timing. Connect the distributor vacuum line at the carburetor.

16. Operate the engine at fast idle and check for oil and coolant leaks. Operate the engine until engine temperatures have stabilized and adjust the engine idle speed and idle fuel mixture.

17. Install the air cleaner and intake duct assembly.

18. Connect the automatic choke heat chamber air inlet hose.

DISASSEMBLY

1. Remove the bearing inserts from the connecting rod and cap.

2. Mark the pistons and pins to assure assembly with the same rod and installation in the same cylinders from which they were removed.

3. Using an Arbor Press and the tool shown in Fig. 56, press the piston pin from the piston and connecting rod. Remove the piston rings.

CLEANING AND INSPECTION

Refer to Part 8-1, Section 3 for the cleaning and inspection procedures.

REPAIRS

Refer to Part 8-1, Section 2 for the repair procedures.

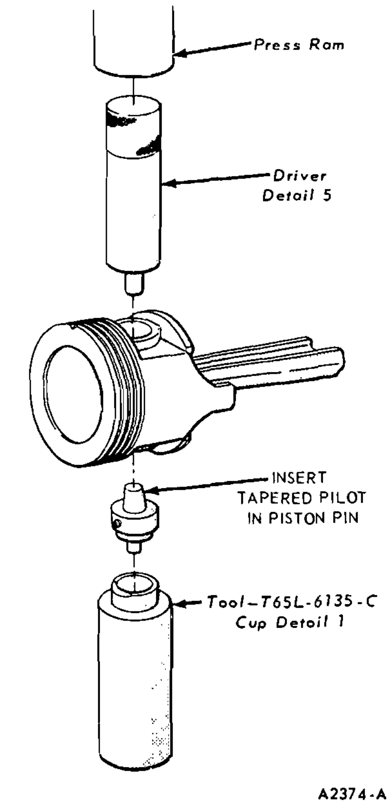


FIG. 56—Piston Pin Removal

ASSEMBLY

The piston, connecting rod and related parts are shown in Fig. 57. **Check the fit of a new piston in the cylinder bore before assembling the piston and piston pin to the connecting rod.**

The piston pin bore of a connecting rod and the diameter of the piston pin must be within specifications. Refer to Part 8-5.

1. Apply a light coat of engine oil to all parts. **Assemble the piston to the connecting rod with the numbered side of the connecting rod and the indentation notch in the piston positioned as shown in Fig. 58.**

2. Start the piston pin in the piston and connecting rod. Using an Arbor Press, press the piston pin through the piston and connecting rod until the end of the pin is 1.000 inch from the side of the connecting rod (Fig. 59).

3. Check the end gap of all piston rings (Part 8-1). It must be within specifications (Part 8-5). Follow the instructions contained on the piston ring package and install the piston rings.

4. Check the ring side clearance of the compression rings with a feeler gauge inserted between the ring and its lower land. (Part 8-1,

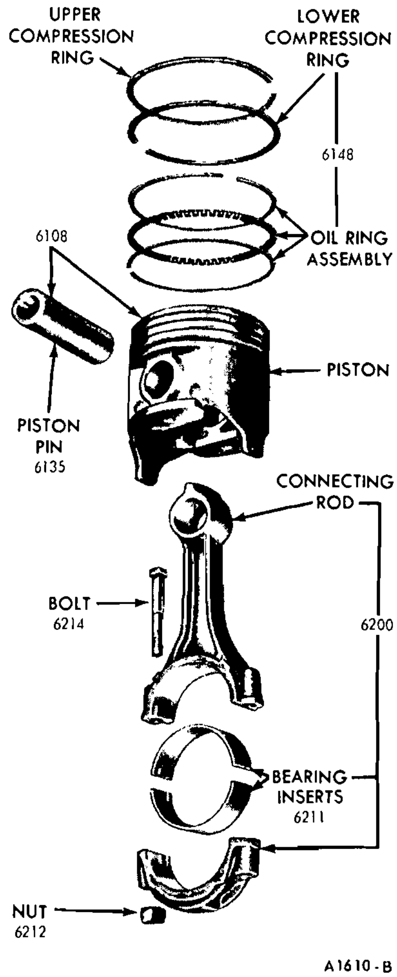


FIG. 57—Piston, Connecting Rod and Related Parts

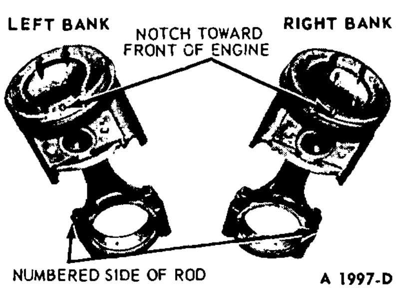


FIG. 58—Correct Piston and Rod Positions

Section 2). The gauge should slide freely around the entire ring circumference without binding. Any wear that occurs will form a step at the inner portion of the lower land. **If the lower lands have high steps, the piston should be replaced.**

5. Be sure the bearing inserts and the bearing bore in the connecting rod and cap are clean. Foreign material under the inserts will distort the bearing and cause a failure. Install the bearing inserts in the connecting rod and cap with the tangs fitting in the slots provided.

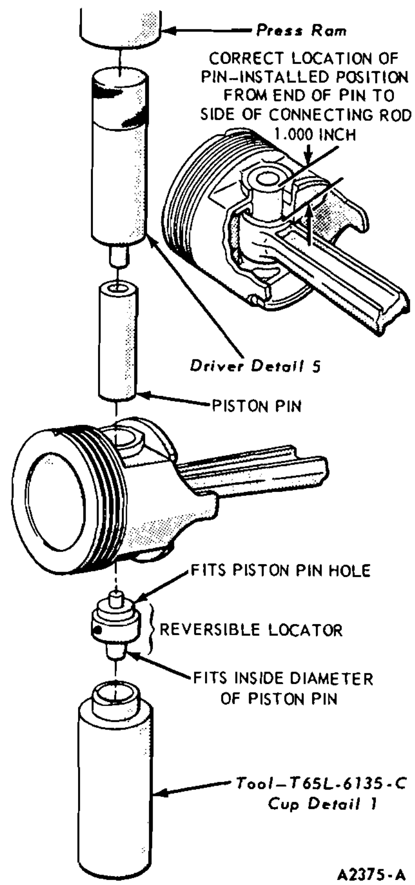


FIG. 59—Piston Pin Installation

FLYWHEEL

REMOVAL

1. On a vehicle with a manual-shift transmission, remove the transmission, clutch pressure plate and disc following the procedures in Group 5.

On a vehicle with an automatic transmission, remove the transmission and converter housing following the procedure in Group 7.

2. Remove the flywheel retaining bolts and remove the flywheel.

CLEANING AND INSPECTION

Refer to Part 8-1, Section 3 for the cleaning and inspection procedures for manual-shift transmissions.

REPAIRS

To check flywheel face runout refer to Part 8-1, Section 1.

INSTALLATION

1. Coat the threads of the flywheel retaining bolts with oil-resistant sealer. Position the flywheel on the crankshaft flange. Install and torque the bolts in sequence across from each other to specifications.

2. On a vehicle with a manual-shift transmission check the flywheel runout, following the procedure in Part 8-1, Section 1 and install the clutch pressure plate, disc and the transmission following the procedures in Group 5.

On a vehicle with an automatic transmission check the flywheel runout, following the procedure in Part 8-1, Section 1 and install the transmission and converter housing following the procedure in Group 7.

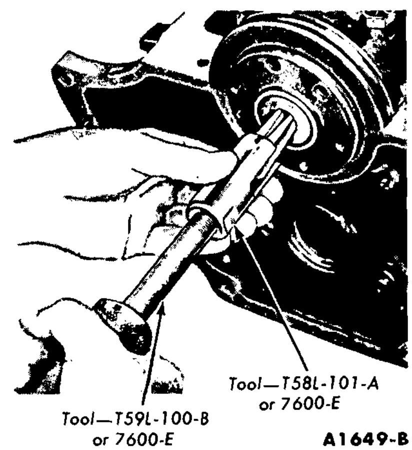


FIG. 60—Clutch Pilot Bushing Removal

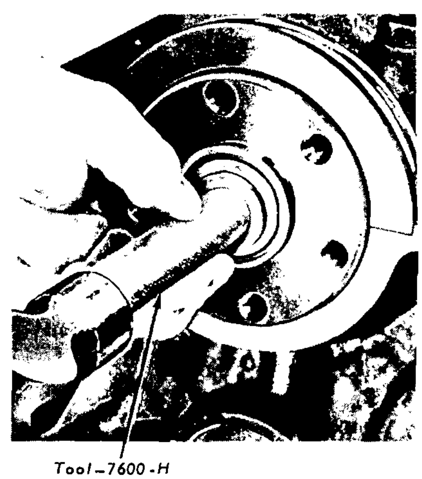


FIG. 61—Clutch Pilot Bearing Installation

CLUTCH PILOT BUSHING REPLACEMENT

1. Remove the transmission, clutch pressure plate and disc following the procedures in Group 5.

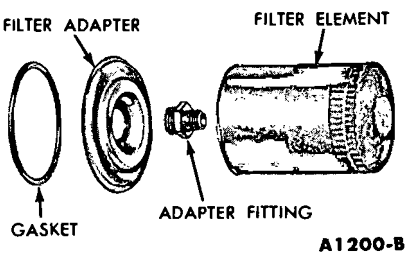


FIG. 62—Cartridge-Type Oil Filter

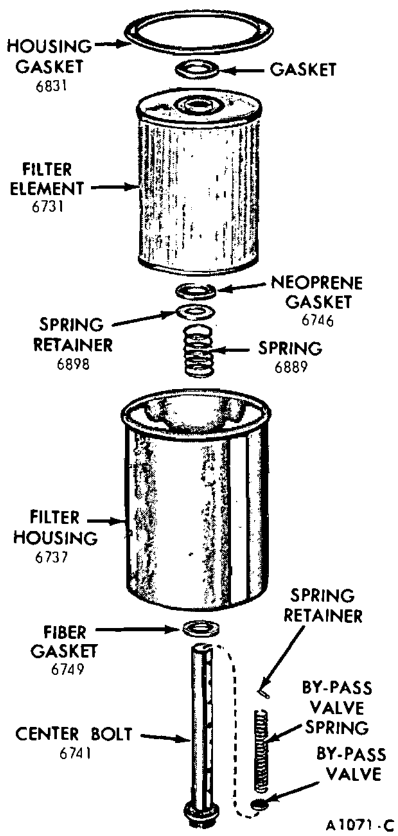


FIG. 63—Element-Type Oil Filter

2. Remove the pilot bushing as shown in Fig. 60.
3. Coat the pilot bushing bore in the crankshaft with a small quantity of wheel bearing lubricant. **Avoid using too much lubricant as it may be thrown onto the clutch disc when the clutch revolves.**
4. Install the pilot service bearing as shown in Fig. 61.
5. Install the clutch pressure plate, disc and the transmission, following the procedures in Group 5.

OIL FILTER REPLACEMENT

CARTRIDGE-TYPE OIL FILTER

The oil filter assembly is shown in Fig. 62.

1. Place a drip pan under the filter. Unscrew the filter from the adapter fitting and clean the adapter recess.
2. Coat the gasket on a new filter with oil. Place the new filter in position on the adapter fitting. Hand tighten the filter until the gasket contacts the adapter face, and then advance it 1/2 turn.
3. Operate the engine at fast idle, and check for oil leaks. If oil leaks are evident, perform the necessary repairs to correct the leakage. Check the oil level and fill the crankcase if necessary.

ELEMENT-TYPE OIL FILTER

The oil filter assembly is shown in Fig. 63.

1. Place a drip pan under the filter. Loosen the filter center bolt, and remove the filter assembly and gasket.
2. Remove the filter element, neoprene gasket, spring and seat. Remove the center bolt from the filter cover and the fiber gasket from the bolt. Discard the filter element and all gaskets.
3. Wash all parts in solvent. Make sure all the openings in the center bolt are clean.
4. Install a new filter element in the filter cover following the instructions furnished with the new element.
5. Clean the oil filter cover mounting surface on the adapter. Position a new gasket in the adapter recess.
6. Place the filter assembly in position, and thread the center bolt into the adapter finger-tight. Rotate the filter slightly, in each direction, to make sure the gasket is seated evenly.
7. Torque the center bolts to specifications. **Do not overtighten the center bolt.**
8. Add oil to the crankcase if necessary. Operate the engine at fast idle, and check for leaks.
9. If oil leaks are evident, perform the necessary repair to correct the leakage.

OIL PAN

REMOVAL

1. Drain the crankcase. Remove the oil level dipstick.
2. Lower the stabilizer bar. On a Mustang, the idler arm will also have to be lowered.
3. Remove the oil pan retaining bolts and crank the engine as required to obtain clearance and remove the oil pan.
4. Remove the oil pump inlet tube and screen assembly.
5. Remove and discard the inlet tube to pump gasket.

CLEANING AND INSPECTION

Refer to Part 8-1, Section 3 for the cleaning and inspection procedures.

INSTALLATION

1. Clean the oil pump inlet tube and screen assembly.
2. Using a new inlet tube to pump gasket, install the inlet tube and screen assembly.
3. Clean the gasket surfaces of the block and oil pan. The oil pan has a two-piece gasket. Coat the block surface and the oil pan gasket surface with sealer. Position the oil pan gaskets on the cylinder block (Fig. 64).
4. Position the oil pan front seal on the cylinder front cover (Fig. 64). **Be sure the tabs on the seal are over the oil pan gasket.**
5. Position the oil pan rear seal on the rear main bearing cap (Fig. 64). **Be sure the tabs on the seal are over the oil pan gasket.**
6. Hold the oil pan in place against the block and install a bolt, finger-tight, on each side of the oil pan. Install the remaining bolts. Torque the bolts from the center outward in each direction to specifications.
7. Connect the stabilizer bar. On a Mustang, the idler arm must be installed.
8. Install the oil level dipstick. Fill the crankcase with the proper grade and quantity of engine oil. Start the engine and check for oil leaks.

OIL PUMP

REMOVAL

1. Remove the oil pan and related parts as outlined under Oil Pan Removal.
2. Remove the oil pump inlet tube and screen assembly. Discard the gasket.
3. Remove the oil pump retaining bolts and remove the oil pump, gasket and intermediate drive shaft.

INSTALLATION

1. Prime the oil pump by filling either the inlet or outlet port with engine oil. Rotate the pump shaft to distribute the oil within the pump body.
2. Position the intermediate drive shaft into the distributor socket. With the shaft firmly seated in the distributor socket, the stop on the shaft should touch the roof of the crankcase. Remove the shaft and position

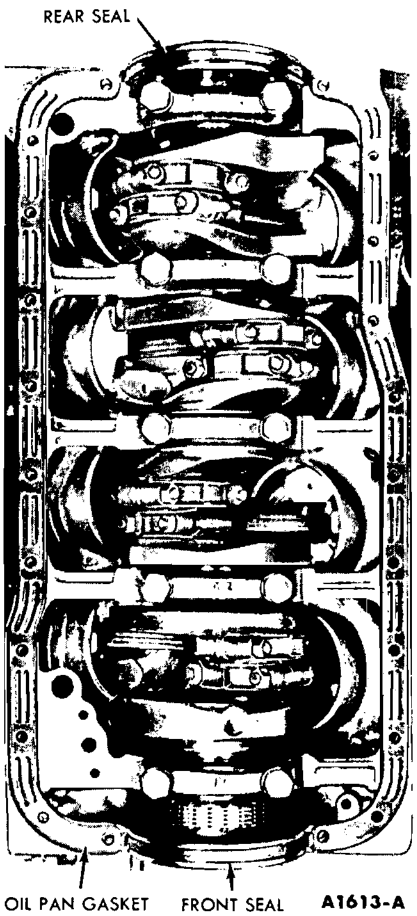


FIG. 64—Oil Pan Gaskets and Seals Installed

the stop as necessary.

3. Position a new gasket on the pump housing. With the stop properly positioned, insert the intermediate drive shaft into the oil pump. Install the pump and shaft as an assembly. **Do not attempt to force the pump into position if it will not seat readily. The drive shaft hex may be misaligned with the distributor shaft. To align, rotate the intermediate drive shaft into a new**

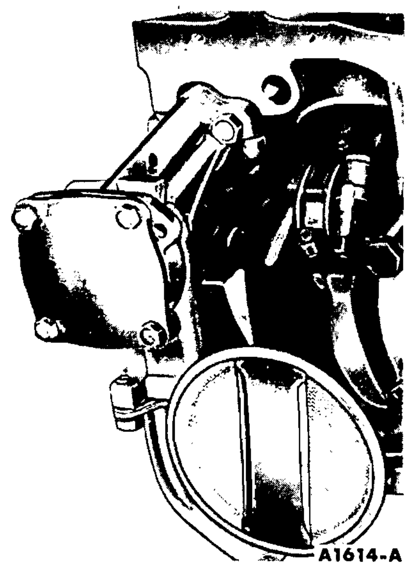


FIG. 65—Oil Pump and Inlet Tube Installed

position. Torque the oil pump retaining screws to specifications.

4. Clean the oil pump inlet tube and screen assembly (Fig. 65).

5. Using a new gasket, install the oil pump inlet tube and screen assembly.

6. Install the oil pan and related parts as outlined under Oil Pan Installation.

DISASSEMBLY

1. Remove the oil inlet tube from the oil pump and remove the gasket.

2. Remove the cover retaining screws and the cover. Remove the inner rotor and shaft assembly, then remove the outer race.

3. Insert a self-threading sheet metal screw of the proper diameter into the oil pressure relief valve chamber cap and pull the cap out of the chamber. Remove the spring and plunger.

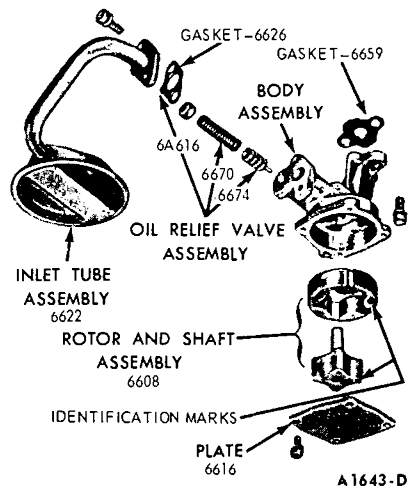


FIG. 66—Oil Pump Assembly

CLEANING AND INSPECTION

Refer to Part 8-1, Section 3 for the cleaning and inspection procedures.

ASSEMBLY

The oil pump assembly is shown in Fig. 66.

1. Oil all parts thoroughly.

2. Install the oil pressure relief valve plunger, spring and a new cap.

3. Install the outer race, and the inner rotor and shaft assembly. **The inner rotor and shaft, and the outer race are serviced as an assembly. One part should not be replaced without replacing the other. Be certain that the dimple (identification mark) on the outer race is facing outward on the same side as the identification mark on the rotor.** Install the cover and torque the cover retaining screws to specifications.

4. Position a new gasket and the oil inlet tube on the oil pump and install the retaining bolts.

3 ENGINE REMOVAL AND INSTALLATION

The engine removal and installation procedures are for the engine only without the transmission attached.

REMOVAL

1. Drain the cooling system and the crankcase. Remove the oil filter.

2. Remove the hood. Disconnect the battery ground cable at the cylinder block.

3. Disconnect the automatic choke heat chamber air inlet hose at the inlet tube near the right valve rocker arm cover. Remove the air cleaner and intake duct assembly.

4. Disconnect the radiator upper hose at the coolant outlet housing and the radiator lower hose at the water pump.

On a vehicle with an automatic transmission, disconnect the transmission oil cooler lines at the radiator.

5. Remove the radiator. Remove the fan, spacer, belt and pulley.

6. Disconnect the wires at the alternator. Loosen the alternator adjusting bolts to allow the alternator to swing down and out of the way.

7. Disconnect the oil pressure sending unit wire at the sending unit, and the flexible fuel line at the fuel tank line. Plug the fuel tank line.

8. Disconnect the accelerator rod.

On a vehicle with an automatic transmission, disconnect the throttle valve vacuum line at the intake manifold. Disconnect the manual shift rod and remove the retracting spring. Disconnect the transmission filler tube bracket at the cylinder block.

On a vehicle with an air conditioner, isolate and remove the compressor as outlined in Group 16.

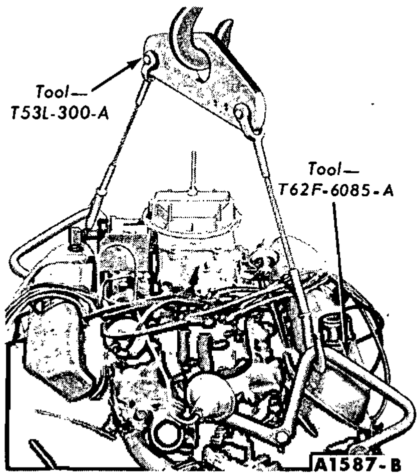


FIG. 67—Engine Lifting Brackets and Sling—Typical

On a vehicle with power steering, disconnect the power steering pump bracket from the cylinder head. Remove the drive belt. Wire the power steering pump out of the way and in a position that will prevent the oil from draining out.

On a vehicle with power brakes, disconnect the brake vacuum line at the intake manifold.

On an engine equipped with Thermactor exhaust emission control system, remove the air pump air filter if it is not connected to the engine.

9. Remove the heater hose from the automatic choke housing. Disconnect the heater hoses at the water pump and intake manifold. Disconnect the water temperature sending unit wire at the sending unit.

10. Remove the flywheel or converter housing to engine upper bolts.

11. Disconnect the primary wire at the ignition coil and position the wire out of the way.

12. Raise the front of the vehicle. Disconnect the starter cable at the starter. Remove the starter and dust seal.

13. Disconnect the muffler inlet pipes from the exhaust manifolds. Disconnect the engine support insulators at the brackets on the frame underbody.

On a vehicle with a manual-shift transmission, remove the remaining flywheel housing to engine bolts.

On a vehicle with an automatic transmission, remove the converter housing inspection cover. Disconnect the flywheel from the converter. Secure the converter assembly in the housing. Remove the remaining converter housing to engine bolts.

14. Lower the vehicle, then support the transmission. Install the engine left lifting bracket at the front of the left cylinder head, and install the engine right lifting bracket at the rear of the right cylinder head; then attach the engine lifting sling (Fig. 67).

15. Remove the air cleaner duct stud from the exhaust manifold. Remove the battery.

16. Raise the engine slightly and carefully pull it from the transmission. Carefully lift the engine out of the engine compartment so that the rear cover plate is not bent or other components damaged. Install the engine on a work stand.

INSTALLATION

1. Position new gaskets on the muffler inlet pipes.

2. Attach the engine lifting brackets and sling (Fig. 67). Remove the engine from the work stand.

3. Lower the engine carefully into the engine compartment. Make sure the exhaust manifolds are properly aligned with the muffler inlet pipes and the dowels in the block are through the rear cover plate and engage the holes in the flywheel housing.

On a vehicle with an automatic transmission, start the converter pilot into the crankshaft.

On a vehicle with a manual-shift transmission, start the transmission main drive gear into the clutch disc. It may be necessary to adjust the position of the transmission in relation to the engine if the input shaft will not enter the clutch disc. **If the engine hangs up after the shaft enters, turn the crankshaft slowly (transmission in gear) until the shaft splines mesh with the clutch disc spline.**

4. Install the flywheel or converter housing upper bolts.

5. Install the engine support insulator to bracket retaining nuts. Disconnect the engine lifting sling and remove the lifting brackets.

6. Raise the front of the vehicle. Connect both exhaust manifolds to the muffler inlet pipes. Torque the nuts to specifications.

7. Position the dust seal and install the starter.

On a vehicle with a manual-shift transmission, install the remaining flywheel housing to engine bolts.

On a vehicle with an automatic transmission, remove the retainer securing the converter in the housing. Attach the converter to the flywheel. Install the converter housing in spection cover. Install the remaining converter housing retaining bolts.

8. Remove the support from the transmission and lower the vehicle.

9. Connect the engine ground strap and coil primary wire.

10. Connect the water temperature sending unit wire. Install the heater hose on the automatic choke housing and connect the hose at the intake manifold.

11. Connect the accelerator rod.

On a vehicle with an automatic transmission, connect the transmission filler tube bracket. Connect the manual shift rod and install the retracting spring. Connect the throttle valve vacuum line.

On a vehicle with an air conditioner, install the compressor as outlined in Group 16.

On a vehicle with power steering, install the drive belt and power steering pump bracket. Install the bracket retaining bolts. Adjust the drive belt tension to specifications.

On a vehicle with power brakes, connect the brake vacuum line.

12. Remove the plug from the fuel tank line. Connect the flexible fuel line and the oil pressure sending unit wire.

13. Install the pulley, belt, spacer and fan. Adjust the belt tension to specifications.

14. Install the battery. Install the air cleaner duct stud on the exhaust manifold.

15. Tighten the alternator adjusting bolts. Connect the alternator wires and the battery ground cable.

16. Install the radiator. Connect the radiator upper and lower hoses.

On a vehicle with an automatic transmission, connect the transmission oil cooler lines.

17. Install the oil filter. Fill and bleed the cooling system. Connect the heater hose at the water pump. Fill the crankcase with the proper grade and quantity of oil.

18. Adjust the transmission throttle linkage.

19. Operate the engine at fast idle

and check all gaskets and hose connections for leaks.

20. Install the air cleaner and intake duct assembly. Connect the automatic choke heat chamber air inlet hose.

On an engine equipped with Thermactor exhaust emission control system, install the air pump air filter if it was removed.

21. Install and adjust the hood.

4 MAJOR REPAIR OPERATIONS

When installing nuts or bolts that must be torqued (refer to Part 8-5 for torque specifications), oil the threads with light weight engine oil. **Do not oil threads that require oil-resistant or water-resistant sealer.**

To perform the operations in this section, it will be necessary to remove the engine from the vehicle and install it on a work stand.

CRANKSHAFT

The crankshaft and related parts are shown in Fig. 68.

REMOVAL

1. Disconnect the spark plug wires at the spark plugs and remove the wires from the ignition harness brackets on the valve rocker arm covers. Disconnect the coil to distributor high tension lead at the coil. Remove the distributor cap and spark plug wire assembly. Remove the spark plugs to allow easy rotation of the crankshaft.

2. Remove the fuel pump and oil filter. Slide the water pump bypass hose clamp toward the water pump. Remove the alternator and mounting brackets.

If the engine is equipped with Thermactor exhaust emission control system, remove the air pump and brackets from the right cylinder head.

3. Remove the crankshaft pulley from the crankshaft vibration damper. Remove the cap screw and washer from the end of the crankshaft. Install the puller on the crankshaft vibration damper (Fig. 37) and remove the damper.

4. Remove the cylinder front cover and water pump as an assembly.

5. Remove the crankshaft front oil slinger. Check the timing chain deflection; then remove the timing chain and sprockets by following steps 12 through 16 under Cylinder Front Cover and Timing Chain Removal.

Remove the counterweight (high performance engines only).

6. Invert the engine on the work stand. Remove the clutch pressure plate and disc (manual-shift transmission). Remove the flywheel and engine rear cover plate. Remove the oil

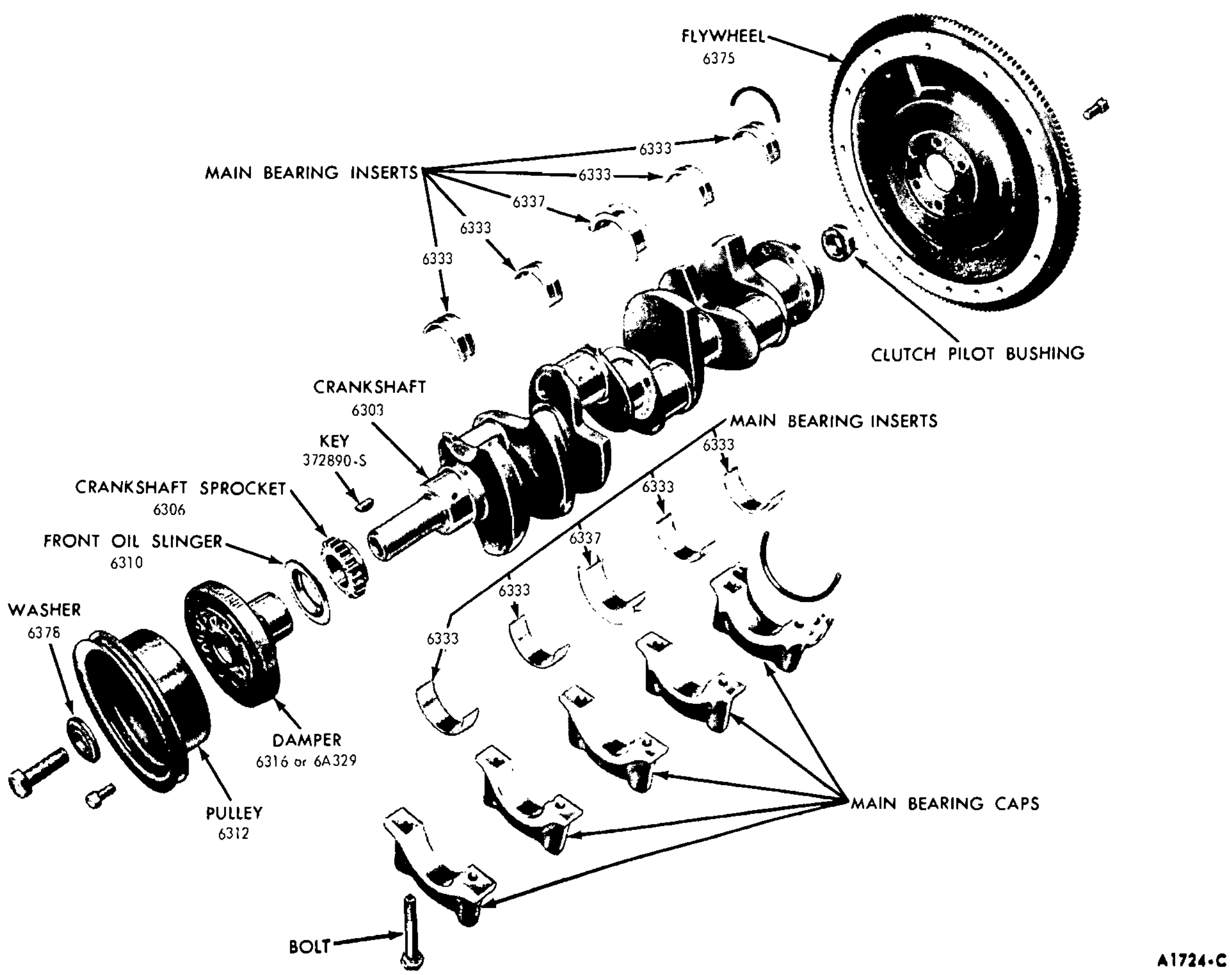


FIG. 68—Crankshaft and Related Parts

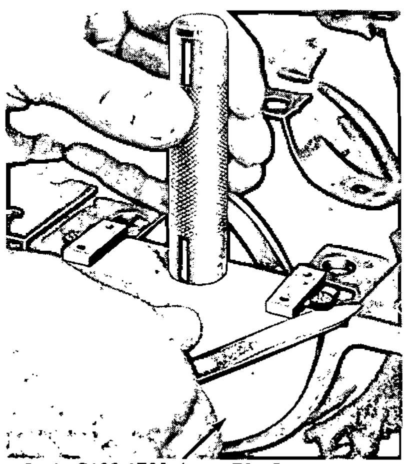


FIG. 69—Rear Oil Seal to Block Installation

pan and gasket. Remove the oil pump.

7. **Make sure all bearing caps (main and connecting rod) are marked so that they can be installed in their original locations.** Turn the crankshaft until the connecting rod from which the cap is being removed is down and remove the bearing cap. Push the connecting rod and piston assembly up into the cylinder. Repeat this procedure until all the connecting rod bearing caps are removed.

8. Remove the main bearing caps.

9. Carefully lift the crankshaft out of the block so that the thrust bearing surfaces are not damaged. **Handle the crankshaft with care to avoid possible fracture or damage to the finished surfaces.**

CLEANING AND INSPECTION

Refer to Part 8-1, Section 3 for the cleaning and inspection procedures. Clean the crankshaft damper, following the referenced procedure.

REPAIRS

To refinish journals, dress minor imperfections, etc., refer to Part 8-1, Section 2.

INSTALLATION

1. Remove the rear journal oil seal from the block and rear main bearing cap.

2. Remove the main bearing inserts from the block and bearing caps.

3. Remove the connecting rod bearing inserts from the connecting rods and caps.

4. If the crankshaft main bearing journals have been refinished to a definite undersize, install the correct undersize bearings. Be sure the bearing inserts and bearing bores are clean. Foreign material under the inserts will distort the bearing and cause a failure.

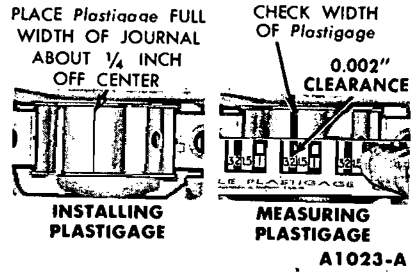


FIG. 70—Installing and Measuring Plastigage—Engine on Work Stand

5. Place the upper main bearing inserts in position in the bores with the tang fitting in the slot provided.

6. Install the lower main bearing inserts in the bearing caps.

7. Clean the rear journal oil seal groove and the mating surfaces of the block and rear main bearing cap. Preform the new seal by hand to the approximate radius of the cap.

8. Insert the seal in the oil seal groove, seating the center of the seal first and allowing the seal to extend equally on both ends. Press the seal down firmly with the thumb at the center of the seal; then press both ends of the seal into the groove, working from the ends to the center.

9. Position the seal forming tool as shown in Fig. 69 and complete the seal installation. After installation, cut the ends of the seal flush.

10. Carefully lower the crankshaft into place. **Be careful not to damage the bearing surfaces.**

11. Check the clearance of each main bearing as follows:

Place a piece of Plastigage on the crankshaft journal the full width of the journal and about 1/4 inch off-center (Fig. 70). Follow steps 11 thru 15 under Main Bearing Replacement.

12. After the bearings have been fitted, apply a light coat of engine oil to the journals and bearings. Install a new seal in the rear main bearing cap and install the rear main bearing cap by following steps 17 thru 20 under Main Bearing Replacement. Install all the bearing caps, except the thrust bearing cap (No. 3 bearing). **Be sure that the main bearing caps are installed in their original locations.** Torque the bearing cap bolts to specifications.

13. Install the thrust bearing cap with the bolts finger-tight.

14. Pry the crankshaft forward against the thrust surface of the upper half of the bearing (Fig. 52).

15. Hold the crankshaft forward and pry the thrust bearing cap to the rear (Fig. 52). This will align the thrust surfaces of both halves of the bearing.

16. Retain the forward pressure on the crankshaft. Tighten the cap bolts to specifications (Fig. 52).

17. Force the crankshaft toward the rear of the engine.

18. Check the crankshaft end play (refer to Part 8-1, Section 1).

19. Install new bearing inserts in the connecting rods and caps. Check the clearance of each bearing following the recommended procedure.

20. After the connecting rod bearings have been fitted, apply a light coat of engine oil to the journals and bearings.

21. Turn the crankshaft throw to the bottom of its stroke. Push the piston all the way down until the rod bearing seats on the crankshaft journal.

22. Install the connecting rod cap. Torque the nuts to specifications.

23. After the piston and connecting rod assemblies have been installed, check the side clearance between the connecting rods on each connecting rod crankshaft journal (Fig. 55).

24. Install the crankshaft counterweight (high performance engines only). Install the timing chain and sprockets, cylinder front cover and crankshaft pulley and adapter, following steps 1 through 8 under Cylinder Front Cover and Timing Chain Installation.

25. Coat the threads of the flywheel retaining bolts with oil-resistant sealer. Position the flywheel on the crankshaft flange. Install and torque the bolts to specifications.

On a flywheel for a manual-shift transmission, use tool 6392-N to locate the clutch disc. Install the pressure plate. Tighten the retaining bolts.

26. Clean the oil pan, oil pump and oil pump screen. Prime the oil pump by filling either the inlet or outlet port with engine oil and rotating the pump shaft to distribute oil within the housing. Install the oil pump and oil pan by following the procedures under Oil Pan and Oil Pump Installation.

27. Install the oil filter, fuel pump and connect the fuel lines. Install the alternator, shield and mounting bracket.

If the engine is equipped with a Thermactor exhaust emission control system, install the air pump and mounting bracket.

28. Install the spark plugs, distributor cap and spark plug wires. Connect the spark plug wires and high tension lead.

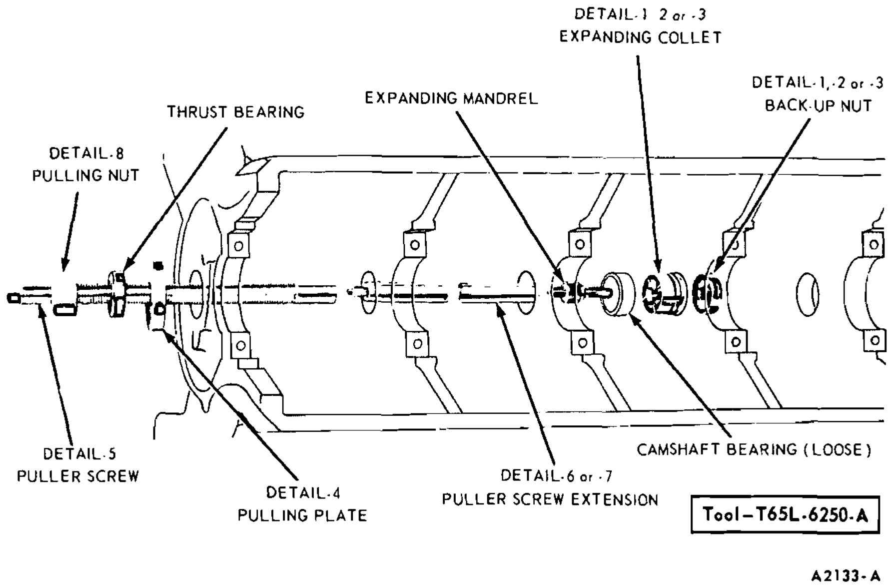


FIG. 71—Typical Camshaft Bearing Replacement

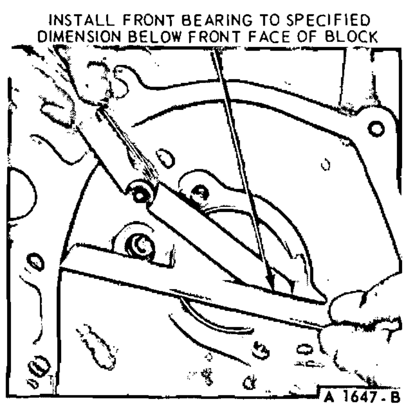


FIG. 72—Camshaft Front Bearing Measurement

29. Install the engine in the vehicle.

CAMSHAFT BEARING REPLACEMENT

Camshaft bearings are available pre-finished to size for standard and 0.015-inch undersize journal diameters. The bearings are not interchangeable from one bore to another.

1. Remove the camshaft, flywheel and crankshaft, following the appropriate procedures in Section 2 or Section 4. Push the pistons to the top of the cylinders.

2. Remove the camshaft rear bearing bore plug (Fig. 46). Remove the camshaft bearings (Fig. 71).

3. Select the proper size expanding collet and back-up nut and assemble on the expanding mandrel. With the expanding collet collapsed, install the collet assembly in the camshaft bearing, and tighten the back-up nut on the expanding mandrel until the collet fits the camshaft bearing.

4. Assemble the puller screw and extension (if necessary) as shown and install on the expanding mandrel. Wrap a cloth around the threads of the puller screw to protect the front bearing or journal. Tighten the pulling nut against the thrust bearing and pulling plate to remove the camshaft bearing. Be sure to hold a wrench on the end of the puller screw to prevent if from turning.

5. Repeat the procedure for each bearing. To remove the front bearing, install the puller screw from the rear of the cylinder block.

6. Position the new bearings at the bearing bores, and press them in place with the tool shown in Fig. 71. Be sure to center the pulling plate and puller screw to avoid damage to the bearing. **Failure to use the correct expanding collet can cause severe bearing damage.** Align the oil holes in the bearings with the oil holes in the cylinder block when the bearings are installed. **Be sure the front bearing is installed the specified distance below the front face of the cylinder block (Fig. 72).**

7. Clean out the camshaft rear bearing bore plug recess thoroughly. Coat the flange of a new plug with oil-resistant sealer and install the plug (Fig. 47) with the flange edge of the plug facing outward.

8. Install the camshaft, crankshaft, flywheel and related parts, following the appropriate procedures in Section 2 or Section 4, except do not check connecting rod and main bearing clearances as a part of Camshaft Bearing Replacement. Install the engine in the vehicle.

CYLINDER ASSEMBLY REPLACEMENT

DISASSEMBLY

Follow steps 1 thru 9, 11 thru 13, and 16 thru 18 under Engine Disassembly. Remove 4 cylinder head dowels from the cylinder block. Remove the cylinder block drain plugs, and remove the cylinder assembly from the work stand.

CLEANING

Clean the gasket and seal surfaces of all parts and assemblies (refer to Part 8-1, Section 3).

ASSEMBLY

Install the replacement cylinder block assembly on a work stand. Install the cylinder block drain plugs and cylinder head dowels. Transfer all parts removed from the old cylinder assembly to the new cylinder assembly, following the procedures in steps 21 through 31 and 35 through 59 under Engine Assembly. Check all assembly clearances and correct as necessary.

CYLINDER BLOCK REPLACEMENT

DISASSEMBLY

Follow steps 1 through 9, 11 through 14, 17 through 24, 27 and 28 under Engine Disassembly. Remove the 4 cylinder head dowels and the cylinder block drain plugs from the cylinder block. Remove the cylinder block from the work stand.

CLEANING AND INSPECTION

Clean the crankshaft damper and the gasket and seal surfaces of all the parts and assemblies (refer to Part 8-1, Section3).

ASSEMBLY

Install the replacement cylinder block on the work stand. Install the cylinder block drain plugs and cylinder head dowels. Transfer the parts removed from the old cylinder block to the new cylinder block by follow-

ing Steps 5, 6, 9 through 12, 14 through 31 and 34 through 59 under Engine Assembly. Check all assembly clearances and correct as necessary.

ENGINE DISASSEMBLY

1. Install the engine on the workstand.

2. Remove the distributor cap and spark plug wire assembly.

3. Disconnect the distributor vacuum line at the distributor. Remove the carburetor fuel inlet line and fuel pump outlet line. Remove the fuel pump and discard the gasket. Remove the oil filter and adapter.

4. Slide the clamp on the water pump bypass hose toward the water pump. Remove the automatic choke-heat tube.

5. Remove the valve rocker arm covers and the crankcase ventilation system.

If the engine is equipped with a Thermactor exhaust emission control system, remove the backfire suppressor valve and bracket, the air pump and brackets and all the hoses.

6. Remove the alternator mounting brackets. Remove the ignition coil. Remove the distributor hold-down bolt and remove the distributor.

7. Remove the intake manifold retaining bolts. Raise the manifold and carefully remove it from the engine. Discard the intake manifold gaskets, seals and sealing washers.

8. Loosen the valve rocker arm stud nuts so that the valve rocker arms can be rotated to the side. Remove the valve push rods in sequence and put them in a rack or holder so that they can be installed in their original position.

9. Using a magnet, remove the valve lifters and place them in a rack so that they can be installed in their original bores (Fig. 45).

If the valve lifters are stuck in their bores by excessive varnish, etc., it may be necessary to use a plier-type tool (T52T-6500-DJD or 6500-D) to remove the lifters. Rotate the lifter back and forth to loosen it from the gum or varnish that may have formed at the lifter.

The internal parts of each hydraulic valve lifter assembly are matched sets. Do not intermix the parts. Keep the assemblies intact until they are to be cleaned.

10. Remove the exhaust manifolds and the spark plugs.

11. Install the cylinder head holding fixtures (Fig. 30). Remove the cylinder head bolts and lift the cylinder heads off the block. Discard the cylinder head gaskets.

12. Remove the crankshaft pulley from the crankshaft vibration damper. Remove the cap screw and washer from the end of the crankshaft. Install the puller on the crankshaft vibration damper (Fig. 37) and remove the vibration damper.

13. Remove the oil pan to cylinder front cover retaining bolts. Remove the cylinder front cover retaining screws. Remove the cylinder front cover and water pump as an assembly. Discard the gasket and remove the crankshaft front oil slinger.

14. Check the timing chain deflection and remove the timing chain and sprockets by following steps 12 thru 16 under Cylinder Front Cover and Timing Chain Removal. Remove the crankshaft counterweight (high performance engines only). Remove the crankshaft sprocket key.

15. Remove any ridge and/or carbon deposits from the upper end of the cylinder bores. Move the piston to the bottom of its travel and place a cloth on the piston head to collect the cuttings. Remove the cylinder ridge with a ridge cutter. Follow the instructions furnished by the tool manufacturer. **Never cut into the ring travel area in excess of 1/32 inch when removing ridges.** After the ridge has been removed, remove the cutter from the cylinder bore.

16. On a flywheel for a manual-shift transmission, remove the clutch pressure plate and disc.

17. Remove the flywheel and rear cover plate. Remove the clutch pilot bushing (Fig. 60).

18. Invert the engine. Remove the oil pan and discard the gaskets and seals.

19. Remove the oil pump and inlet tube as an assembly. Remove the intermediate drive shaft. Discard the oil pump gasket.

20. Make sure all connecting rods and caps are marked so that they can be installed in their original locations. Turn the crankshaft until the connecting rod being removed is down. Remove the rod cap.

21. Push the connecting rod and piston assembly out the top of the cylinder with the handle end of a hammer. **Avoid damage to the connecting rod journal or the cylinder wall when removing the piston and rod.**

22. Remove the bearing inserts from the connecting rods and caps. Install the rod caps on the connecting rods from which they were removed.

23. Remove the main bearing caps.

24. Carefully lift the crankshaft out of the cylinder block so that the thrust bearing surfaces are not damaged. **Handle the crankshaft with care to avoid possible fracture or damage to the finished surfaces.**

25. Remove the rear journal oil seal from the block and rear bearing cap.

26. Remove the main bearing inserts from the block and bearing caps. Install the main bearing caps in their original positions.

27. Remove the camshaft thrust plate. Carefully remove the camshaft by pulling it toward the front of the engine. Use caution to avoid damaging the journals and lobes.

28. Remove the oil filter adapter.

29. Remove the camshaft rear bearing bore plug (Fig. 46). Remove the camshaft bearings (Fig. 71).

ENGINE ASSEMBLY

If the cylinder block is to be replaced, transfer the cylinder head dowels and cylinder block drain plugs to the new cylinder block and start the assembly procedures with step 5.

1. If the original block is used, remove the glaze from the cylinder bores by following the instructions of the tool manufacturer.

2. Invert the engine on the work stand.

3. Position the new camshaft bearings at the bearing bores, and press them in place with the tool shown in Fig. 71. Align the oil holes in the cylinder block when the bearings are installed. **Be sure the camshaft front bearing is installed specified distance below the front face of the cylinder block (Fig. 72).**

4. Clean out the camshaft rear bearing bore plug recess thoroughly. Coat the flange of a new plug with oil-resitant sealer and install it with the cup side facing out (Fig. 47). Drive the plug in until it is slightly below the chamfer in the bore.

5. Oil the camshaft journals and apply Lubriplate to all lobes, then carefully slide it through the bearings. Install the camshaft thrust plate and then check camshaft end play as shown in Part 8-1, Section 1.

6. Clean the year journal oil seal groove and the mating surfaces of the block and rear main bearing cap. Preform the new seal by hand to the approximate radius of the cap.

7. Insert the seal in the oil seal groove, seating the center of the seal first and allowing the seal to extend equally on both ends. Press the seal down firmly with the thumb at the center of the seal, then press both

ends of the seal into the groove, working from the ends to the center.

8. Position the seal forming tool as shown in Fig. 69 and complete the seal installation. After installation, cut the ends of the seal flush.

9. If the crankshaft main bearing journals have been refinished to a definite undersize, install the correct undersize bearings. Be sure the bearing inserts and bearing bores are clean. Foreign material under the inserts will distort the bearing and cause a failure.

Place the upper main bearing inserts in position in the bore with the tang fitting in the slot provided.

10. Install the lower main bearing inserts in the bearing caps.

11. Carefully lower the crankshaft into place. **Be careful not to damage the bearing surfaces.**

12. Check the clearance of each main bearing following the procedure under Main Bearing Replacement.

13. After the bearings have been fitted, apply a light coat of engine oil to the journals and bearings.

14. Install a new journal oil seal in the cap (Fig. 51) by following steps 6, 7 and 8. Apply a thin coating of oil-resistant sealer to the rear main bearing cap at the rear of the top mating surface (Fig. 51). **Do not apply sealer to the area forward of the oil slinger groove.** Install the rear main bearing cap and the remainder of the caps, except the thrust bearing cap (No. 3 bearing). **Be sure that the main bearing caps are installed in their original positions.** Torque the bearing cap bolts to specifications.

15. Install the thrust bearing cap and check crankshaft end play by following steps 13 thru 20 under Crankshaft Installation.

16. Turn the engine on the work stand so that the front end is up.

17. Install the pistons and connecting rods by following steps 1 thru 9 under Piston and Connecting Rod Installation.

18. Install the crankshaft counterweight (high performance engines only.) Position the sprockets and timing chain on the camshaft and crankshaft (Fig. 39). Be sure the timing marks on the sprockets are positioned as shown in Fig. 38.

19. Lubricate the timing chain and sprockets with engine oil.

20. Install the fuel pump eccentric, washer and camshaft sprocket cap screw. Torque the sprocket cap screw to specifications. Install the crankshaft front oil slinger (Fig. 41).

21. Clean the cylinder front cover and the cylinder block gasket surfaces. Install a new crankshaft front oil seal (Fig. 40).

22. Coat the gasket surface of the block and cover and the cover bolt threads with oil-resistant sealer. Position a new gasket on the block.

23. Install the alignment pilot tool on the cylinder front cover so that the keyway in the pilot aligns with the key in the crankshaft. Position the cover (and water pump) and pilot over the end of the crankshaft and against the block (Fig. 42).

24. Install the cylinder front cover screws finger tight. While pushing in on the pilot, torque the cover bolts to specifications. Remove the pilot.

25. Lubricate the crankshaft with a white lead and oil mixture and apply lubriplate to the oil seal rubbing surface of the vibration damper inner hub to prevent damage to the oil seal.

26. Line up the crankshaft vibration damper keyway with the key on the crankshaft, then install the vibration damper on the crankshaft (Fig. 43). Install the damper cap screw and washer, and torque the screw to specifications. Install the crankshaft pulley.

27. Invert the engine on the work stand. Position the intermediate drive shaft into the distributor socket. With the shaft firmly seated in the distributor socket, the stop on the shaft should touch the roof of the crankcase. Remove the shaft and position the stop as necessary.

28. With the stop properly positioned, insert the intermediate drive shaft into the oil pump.

29. Prime the oil pump by filling either the inlet or outlet port with engine oil. Rotate the pump shaft to distribute the oil within the pump body.

30. Position a new gasket on the pump housing and install the pump and shaft as an assembly. **Do not attempt to force the pump into position if it will not seat readily. The drive shaft hex may be misaligned with the distributor shaft. To align, rotate the intermediate shaft into a new position.** Torque the oil pump retaining screw to specifications.

31. Clean the gasket surfaces of the block and oil pan. Coat the block surface and the oil pan gasket surface with sealer. Position new gaskets on the block and position a new seal on the cylinder front cover and rear main bearing cap. Make sure the tabs on the seal are over the oil pan gasket. Install the retaining screws and torque them from the center outward to specifications (one screw retains the fuel line bracket).

32. Using a new gasket, install the fuel pump.

33. Turn the engine on the work stand so that the top of the engine is up.

34. Clean the cylinder head and block gasket surfaces. Install the head gasket over the cylinder head dowels.

35. Place the cylinder head on the engine, then remove the holding fixtures. Coat the head bolt threads with water-resistant sealer, and then install the bolts.

36. The cylinder head bolt tightening procedure is performed in three progressive steps. Torque the bolts in sequence (Fig. 31) to 50 ft-lbs, then to 60 ft-lbs and finally to specifications. When cylinder head bolts have been tightened following this procedure, it is not necessary to retorque the bolts after extended operation. However, the bolts may be checked and retorqued, if desired.

37. Coat the cylinder head mating surfaces of the exhaust manifold with a light film of graphite grease. Position new gaskets on the muffler inlet pipe.

38. Position the exhaust manifolds on the cylinder heads and install the retaining bolts and tab washers. Torque the retaining bolts to specifications, working from the center to the ends. Lock the bolts by bending one tab of the washer over a flat on the bolt.

39. Install the spark plugs.

40. Use the hydraulic valve lifter leakdown tester (Part 8-1) to fill the lifters with test fluid. Coat the outside of each valve lifter with engine oil to provide initial lubrication. Place each lifter in the bore from which it was removed.

41. Install the push rods in their original positions. Apply Lubriplate over the valve stem tips. Install the rocker arms over the push rods. Perform a valve clearance adjustment as outlined in Part 8-1, Section 2.

42. Clean the mating surfaces of the intake manifold, cylinder heads and cylinder block.

43. Coat the intake manifold and cylinder block seal surfaces with quick-setting adhesive.

44. Position new seals on the cylinder block and new gaskets on the cylinder heads with the gaskets interlocked with the seal tabs. Apply non-hardening sealer at the four junction points of the seals and gaskets. Be sure the holes in the gaskets are aligned with the holes in the cylinder heads.

45. Carefully lower the intake manifold on the cylinder block and cylinder heads. **After the intake**

manifold is in place, run a finger around the seal area to make sure the seals are in place. If the seals are not in place, remove the intake manifold and position the seals.

46. Be sure the holes in the manifold gaskets and manifold are in alignment. Position the intake manifold alignment tools (Fig. 26) in the front and rear (Nos. 10 and 12) bolt holes on the left bank of the manifold.

47. Using new sealing washers, install the intake manifold retaining bolts. Torque the bolts in two steps. First, torque the bolts in sequence (Fig. 27) to 15-17 ft-lbs.

48. Remove the manifold alignment tools from the front and rear bolt holes (Nos. 10 and 12). Using new sealing washers, install the two remaining bolts and torque to 15-17 ft-lbs.

49. Torque all the manifold retaining bolts in sequence to specifications.

50. Install the water pump by-pass hose on the coolant outlet housing. Slide the clamp into position and tighten the clamp.

51. Rotate the crankshaft until the No. 1 piston is on TDC after the compression stroke, then position the distributor in the block with the rotor at the No. 1 firing position and the points open. Install the hold down clamp.

52. Install the ignition coil. Position and install the alternator, shield and mounting bracket.

If the engine is equipped with a Thermactor exhaust emission control system, install the backfire suppressor valve and bracket, the air pump and bracket and the hoses.

53. Clean the valve rocker arm covers and the cylinder head gasket surface. Apply oil-resistant sealer to one side of new cover gaskets. Lay the cemented side of the gaskets in place in the covers.

54. Position the covers on the cylinder heads. Make sure the gasket seats evenly all around the head. Install the bolts. The cover is tightened in two steps. Torque the bolts to specifications. Two minutes later, torque the bolts to the same specifications.

55. Install the crankcase ventilation system.

56. Install the automatic choke heat tube. Install the distributor cap. Position the spark plug wires in the brackets on the valve rocker arm covers. Connect the spark plug wires and the coil wire.

57. Connect the carburetor fuel inlet line and pump inlet line.

58. Install the oil filter adapter. Clean the oil filter gasket surface. Coat the gasket on the filter with oil. Place the filter in position on the adapter fitting. Hand tighten the filter until the gasket contacts the adapter face; then advance it 1/2 turn.

59. Install the clutch pilot service bearing (Fig. 61). Coat the threads of the flywheel retaining bolts with oil-resistant sealer. Position the rear cover plate on the block and the flywheel on the crankshaft flange. Install and torque the bolts to specifications.

On a flywheel for a manual-shift transmission, use tool T58P-7563-A to locate the clutch disc. Install the pressure plate.

60. Install the engine in the vehicle. Fill and bleed the cooling system. Fill the crankcase with the proper grade and quantity of engine oil.

61. Operate the engine and check for oil and coolant leaks. Check and adjust the ignition timing. Connect the distributor vacuum line at the distributor.

62. Adjust the engine idle speed, fuel mixture and anti-stall dashpot (if applicable). Adjust the transmission throttle linkage.

PART 8-4—390 And 427 V-8

1 DESCRIPTION AND OPERATION

The 390 and the 427 V-8 engines (Figs. 1 and 2) have the same basic design. Typical engine sections are shown in Figs. 3 and 4. Differences in the engines are called out when they exist. Refer to Table (Fig. 5) for the engine identification and application.

An engine identification tag is attached to the ignition coil bracket; refer to Part 8-1, Section 1.

MANIFOLDS

On the 390-2V V-8 engines, an engine coolant-heated spacer is located between the carburetor and the intake manifold (Fig. 6). The coolant flows from the front of the engine through the spacer inlet hose and into the carburetor coolant spacer. The coolant circulates through the spacer and flows into the heater inlet hose and into the heater. Exhaust gases provide the initial heat necessary to assist in vaporizing the incoming fuel mixture.

On all engines, except the 390-2V an exhaust control valve, located between the right exhaust manifold and muffler inlet pipe, remains closed during engine warmup. This directs exhaust gases through a heat crossover passage in the intake manifold, to provide the heat necessary to assist in vaporizing the incoming fuel mixture (Fig. 7).

The intake manifold has two sets of fuel passages, each with its own separate inlet connection to the carburetor (Fig. 8). The right barrel(s) of the carburetor feed Nos. 1, 4, 6 and 7 cylinders, and the left barrel(s) feed Nos. 2, 3, 5 and 8 cylinders.

Exhaust manifolds are mounted to the cylinder heads. Compression pressure in the cylinder heads forces engine exhaust gases through the exhaust manifolds into the exhaust system.

The distributor is mounted at the left front of the intake manifold.

Warm air for the automatic choke is drawn from the heat chamber of the right exhaust manifold for the 390 V-8. The warm air for the automatic choke for the 427 V-8 is drawn from the left exhaust manifold.

CYLINDER HEADS

The cylinder head assemblies contain the valves and the valve rocker arm shaft assembly. The combustion chambers are machined in the head. Valve guides are an integral part of the head. The valves are arranged from front to rear on both banks E-I-E-I-I-E-I-E (Fig. 9).

CYLINDER BLOCK

The cylinders are numbered from front to rear, on the right bank 1, 2, 3 and 4 and on the left bank 5, 6, 7 and 8. The firing order is 1-5-4-2-6-3-7-8.

The oil pump, mounted inside the oil pan at the front, is driven by the distributor through an intermediate drive shaft.

The crankshaft is supported by five main bearings. Crankshaft end thrust is controlled by the flanges of the No. 3 main bearing.

On the 427 V-8 engine, cross-bolted main bearing caps are used to reinforce the cylinder block for high-

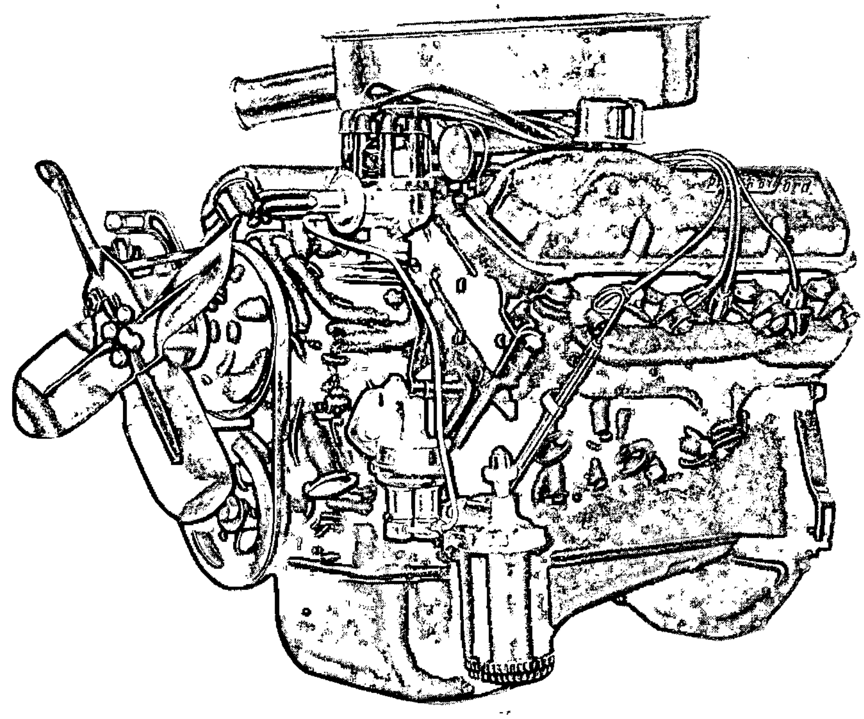


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FIG. 1—Typical Left Front View390 V-8

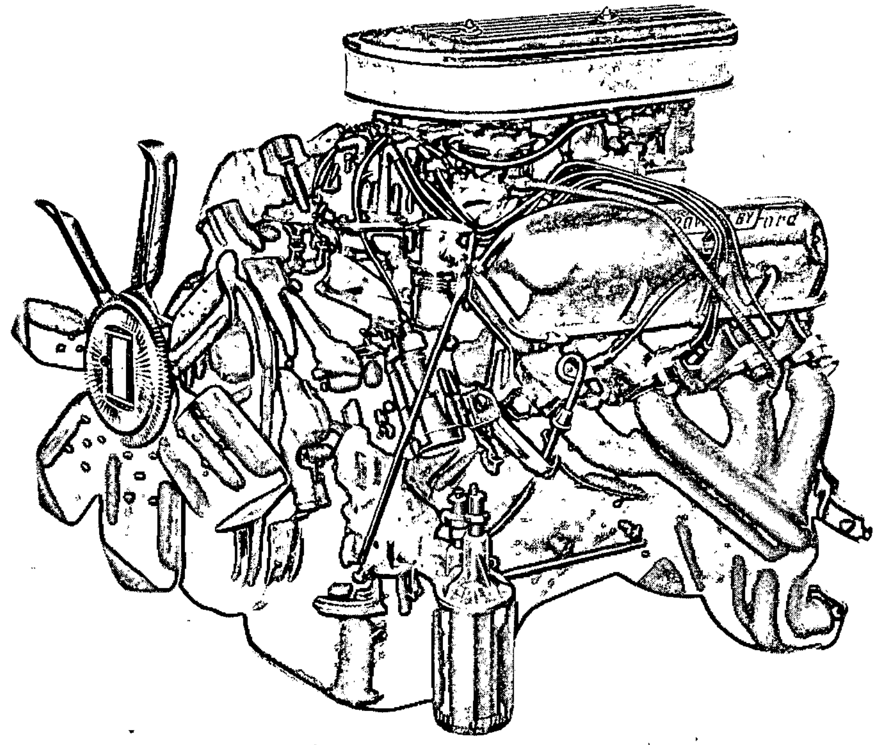

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FIG. 2—3/4 Left Front View 427 V-8 (8V) High Performance

speed, high-stress operation.

The pistons have two compression rings and one oil control ring. The top compression ring is molybdenum-coated, and the lower compression ring is phosphate-coated. The oil control ring assembly consists of a serrated spring and two chrome-plated steel rails. The pistons are the slipper type. Eyebrows are provided for valve clearance.

VALVE TRAIN

The intake and exhaust valve assemblies are the rotating-type which rotate slightly each time the valve opens and closes.

The push rods are solid steel with oil cushioned sockets.

The camshaft is supported by five bearings pressed into the block. It is driven by a sprocket and timing chain in mesh with a sprocket on the crankshaft. Camshaft thrust is controlled by a thrust plate bolted to the front of the cylinder block. An eccentric, bolted to the front end of the camshaft, operates the fuel pump.

On the 427 V-8 engines, mechanical valve lifters are used. Valve lash is maintained by self-locking adjusting screws.

On all other engines, hydraulic valve lifters are used which provide zero valve lash. The valve lifters are housed in bores located in the cylinder block valve lifter chamber. The valve lifters operate directly on the camshaft lobes, thereby transmitting the thrust of the camshaft lobes, by the means of hydraulic pressure, to the push rods which actuate the valve train. Figure 10 shows the various components and operation of a typical hydraulic valve lifter.

When either an exhaust valve or an intake valve is closed, the actuating valve lifter is on the base circle (lowest position) of the camshaft lobe.

When the valve lifter is in this position, the lifter plunger spring expands. This action forces the lifter plunger and valve push rod upward, forcing the valve end of the rocker arm to maintain solid contact with the valve (zero valve lash).

As the lifter plunger moves upward, the volume of the compression chamber is increased, resulting in reduced oil pressure in the compression chamber. Therefore, to equalize the resulting pressure differential between the supply chamber and the compression chamber, the disc valve moves off its seat and permits oil to flow from the supply chamber to the compression chamber. When the

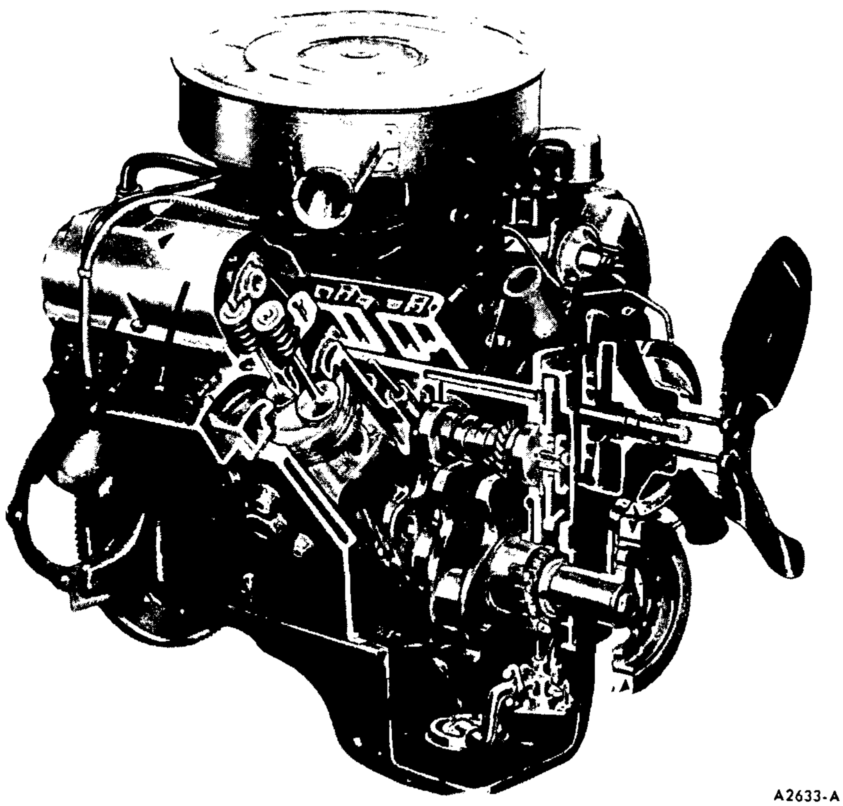

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FIG. 3—Typical 390, V-8 Engine—3/4 Section

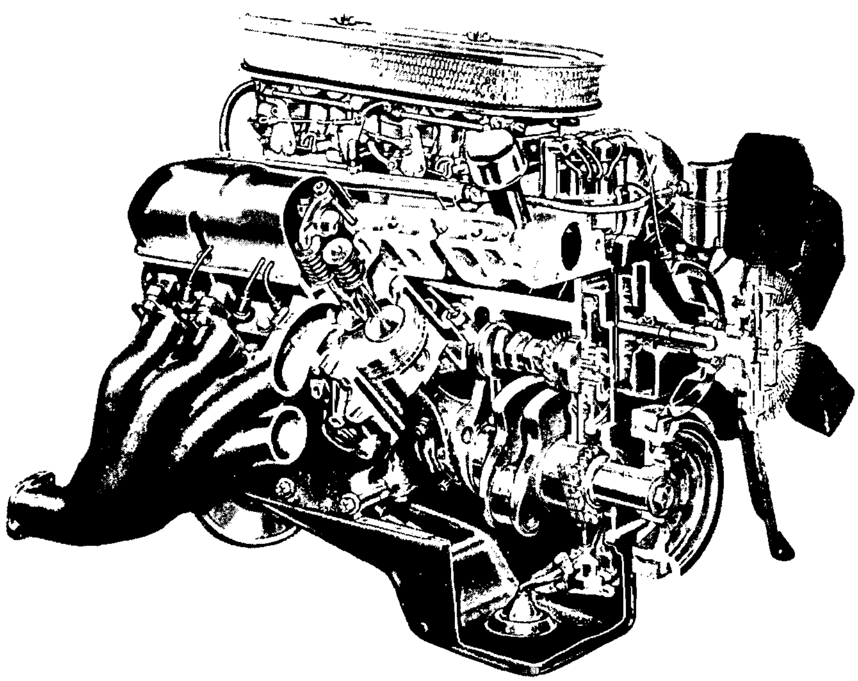

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FIG. 4—3/4 Section View—427 V-8 Engine

compression chamber becomes filled with oil, the pressures in the two chambers are equalized. The oil flow ceases and the disc valve spring seats the disc valve and closes the disc valve port.

As the camshaft rotates, the lifter assembly is raised by the camshaft lobe. This increases the push rod force against the lifter plunger and hydraulic pressure immediately builds up in the compression chamber until it acts as a solid member of the valve operating mechanism. The lifter then becomes a hydraulic ram which forces the valve in the cylinder head to open. During this period, a slight leakage of oil past the plunger occurs (calibrated leak down rate).

As the high point of the camshaft lobe rotates and passes by the foot of the valve lifter, the valve in the cylinder head seats and the valve lifter assembly is forced downward. Reduced force on the lifter plunger at this time relieves the pressure on the lifter plunger and it is free to be moved upward by the plunger spring. This action allows oil to flow once again through the oil holes in the lifter body and plunger.

The operating cycle is completed for each revolution of the camshaft. Zero clearance (lash) in the valve train mechanism is maintained at all times by the hydraulic force and expansion of the plunger spring between the lifter body and plunger.

LUBRICATION SYSTEM

Oil from the oil pan sump, located in the front of the oil pan, is forced through the pressure-type lubrication system (Figs. 11 and 12) by a rototype oil pump. A spring-loaded relief valve in the pump limits the maximum pressure of the system. Oil relieved by the valve is directed back to the intake side of the pump.

All the oil discharged by the pump passes through a full-flow filter before it enters the engine. The filter is mounted in a vertical position at the lower left front of the engine. A relief valve in the filter permits oil to bypass the filter element if it becomes clogged.

On the 427 V-8 engine, an auxiliary oil pressure safety relief valve is located at the rear of the main oil gallery to prevent excessively high pressures in system during cold starts.

From the filter, the oil flows into the main oil gallery which is located in the center of the valve push rod chamber floor (except on the 427 engine). The oil gallery supplies oil to each individual camshaft bearing,

Engine	Warranty Plate Engine Code	Engine Prefix	Piston Displacement	Bore and Stroke	Compression Ratio	Valve Lifters	Carburetor Type and Make	Distributor	Fuel Required
				3.50			Ford	Advance	
390 Special V-8	H	EES	390	4.05 x 3.78	9.5:1	Hydraulic	2-V Ford	Dual Advance	Regular
390 V-8	Y	EES	390	4.05 x 3.78	95:1	Hydraulic	2-V Ford	Dual Advance	Regular
390 V-8	Z	EES	390	4.05 x 378	10.0:1	Hydraulic	4-V Ford	Dual Advance	Premium
				3.98			Ford	Advance	
427 High Performnce V-8	R	EHJ	428	4.23 x 3.78	11.2:1	Mechanical	Two 4-V Holley	Centrifugal Advance	Super-Premium
				3.98			Ford	Advance	
				3.98			Ford	Advance	

FIG. 5—Engine Identification and Application

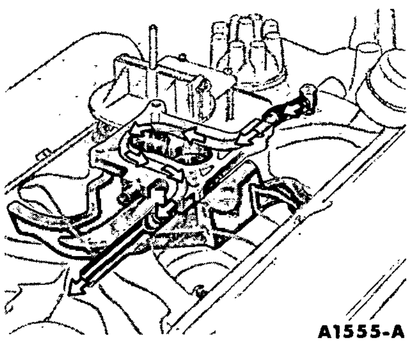

FIG. 6—Typical Engine Coolant—Heated Spacer Passages—390 2V

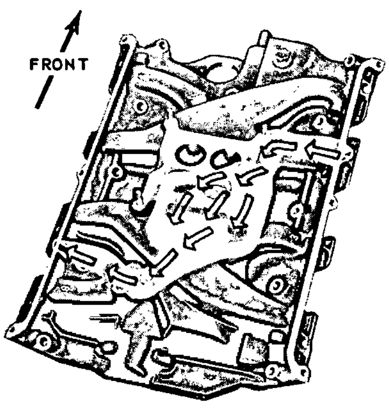

FIG. 7—Typical Intake Manifold Exhaust Gas Passages

FIG. 8—Typical Intake Manifold Fuel Passages

FIG. 9—Valve Port Arrangement

through drilled passages in the block. Passages are drilled from each camshaft bearing to each main bearing. Number 1 camshaft bearing feeds No. 1 main bearing, and No. 2 camshaft bearing feeds No. 2 main bearing, etc.

On the 427 V-8, the oil gallery is located along the left side of the engine. From the gallery oil is delivered to the passages connecting the camshaft bearings and the main bearings. In this manner each bearing receives oil under direct pressure from the oil pump.

The oil then flows through notches or grooves in the main bearings to lubricate the crankshaft journals.

On the 390 and 427 V-8 engines, a jiggle pin in the main oil gallery front plug allows any air that may be trapped in the oil to escape.

Oil drains from the front cam bearing and a bore in the front of the cylinder block to the thrust face of the camshaft sprocket that rides against the cylinder block front surface. The rotation of the camshaft sprocket sprays the oil onto the timing chain and crankshaft sprockets.

The crankshaft is drilled from the main journals to the connecting rod journals.

A small groove is located in the connecting rod at the mating face where the cap contacts the connecting rod. This groove is used as an oil squirt hole for cylinder wall lubrication. Oil from the connecting rod squirt hole lubricates the opposite cylinder wall. For example, the No. 1 connecting rod oils No. 5 cylinder, etc. As the crankshaft turns, the hole in the connecting rod bearing aligns with the hole in the journal causing a direct squirt of oil onto the cylinder wall (Fig. 13).

On engines with hydraulic valve lifters, oil passages are drilled from the main oil gallery to each valve lifter oil gallery. Oil from here feeds the valve lifter assemblies. A reservoir at each valve lifter bore boss traps oil so that oil is available for valve lifter lubrication as soon as the engine starts.

An oil passage is drilled from the camshaft No. 2 bearing web to the left cylinder head between Nos. 5 and 6 cylinders to lubricate the valve rocker arm shaft assembly (Fig. 14). The oil passage in the cylinder head is drilled from the cylinder head bolt bore to the No. 2 valve rocker and shaft support.

The oil flows through the valve rocker arm shaft through drilled holes in each valve rocker arm to lubricate the rocker arm bearing surface and both ends of the valve rocker arm. The excess oil spirals down the rotating push rods and lubricates the push rod seats. The right valve rocker arm shaft assembly is similarly lubricated from No. 4 camshaft bearing via the No. 3 valve rocker arm shaft support.

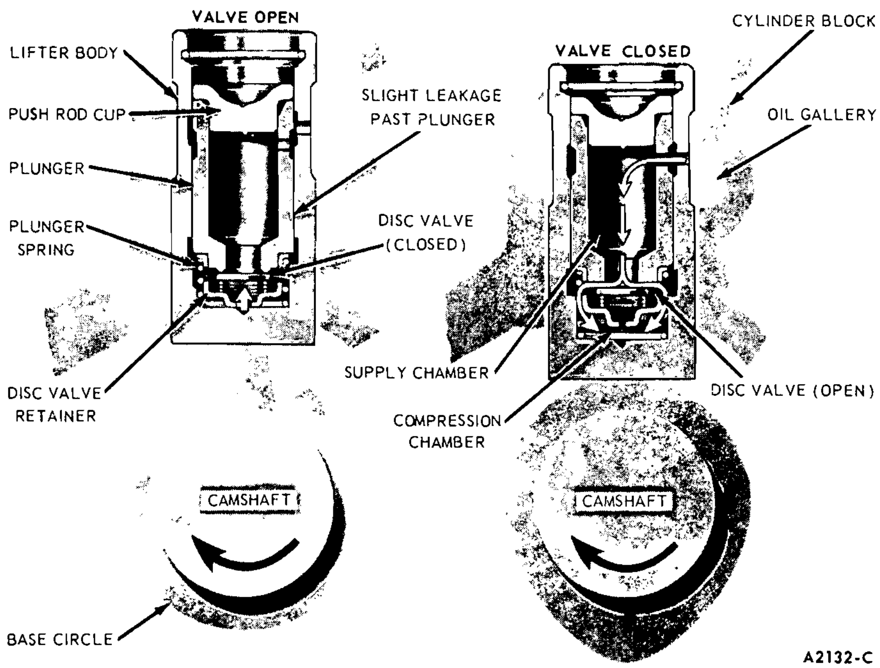

FIG. 10—Typical Hydraulic Valve Lifter Operation

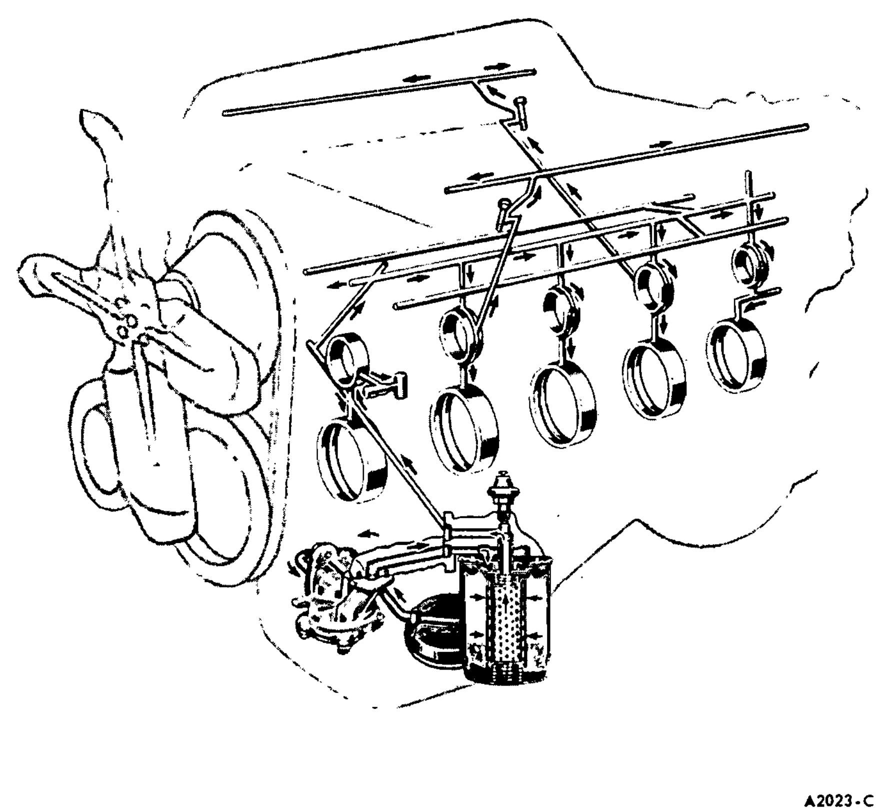

FIG. 11—Lubrication System—390 V-8

A baffle located under the valve rocker arm shaft assembly shields the valve stems from oil splash. Excess oil is returned to the oil pan through drain holes located at each end of the cylinder head and in the push rod chamber floor.

COOLING SYSTEM

The coolant is drawn from the bottom of the radiator by the water pump which delivers the coolant to the cylinder block (Fig. 15).

The coolant travels through cored passages to cool the entire length of each cylinder wall. Upon reaching the rear of the cylinder block, the coolant is directed upward into the cylinder heads where it cools the combustion chambers, valves, and valve seats on its return to the front of the engine.

The coolant from each cylinder head flows through the water passages in the intake manifold past the water thermostat, if it is open, into the radiator header tank. If the thermostat is closed, a small portion of the coolant is returned to the water pump for recirculation. The entire system is pressurized to 12-15 psi.

A centrifugal-type water pump is mounted on the front of the cylinder block. The water pump inlet port is connected to the bottom of the radiator left header tank to draw coolant from the radiator when the thermostat is open. A by-pass port on the water pump is connected to the intake manifold coolant passage to permit coolant circulation within the engine when the thermostat is closed, bypassing the radiator.

A vane-type impeller supplies coolant through centrifugal action to the water pump outlet ports. Two outlet ports, one for each cylinder bank, provide uniform coolant circulation in the engine cooling passages.

The water pump has a sealed bearing integral with the water pump shaft. The bearing requires no lubrication. The hole in the water pump housing is a bleed hole to allow water that may leak past the seal to be thrown out by the slinger. **This is not a lubrication hole.**

The cooling fan hub is pressed a specified distance onto the water pump shaft.

POSITIVE CRANKCASE VENTILATION SYSTEMS

The engines are equipped with a positive crankcase ventilation system of either the open or closed type.

OPEN VENTILATION SYSTEM

The positive crankcase ventilation system is shown in Fig. 16.

The system as used on the 390-2V engine is shown in Fig. 17.

Ventilating air enters the engine through the oil filler cap located on the front of the left valve rocker arm cover. The filler cap contains a filtering element which filters the incoming air.

From the oil filler cap, the air flows into the front section of the valve rocker arm chamber. The ven-

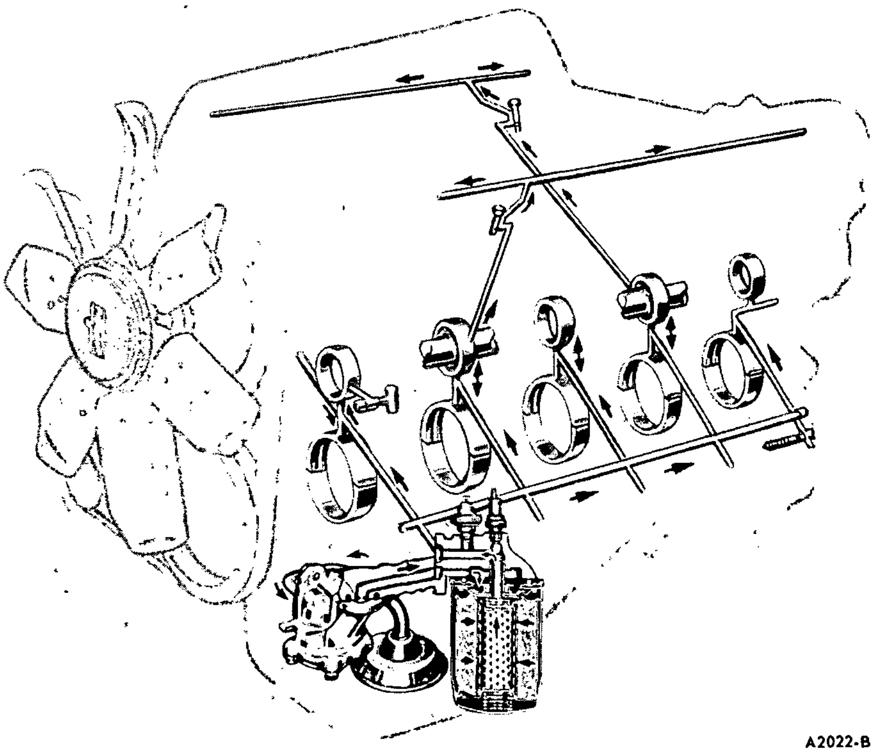

FIG. 12—Lubrication System—427 V-8

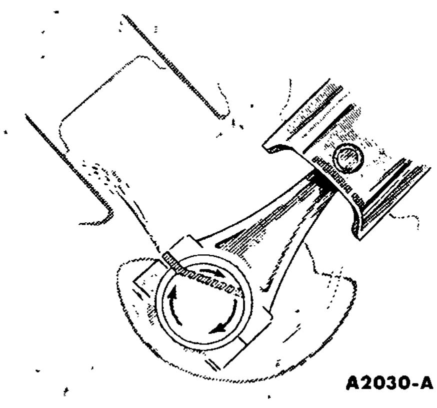

FIG. 13—Connecting Rod Bearing and Cylinder Bore Lubrication

tilating air moves down past the push rods into the front of the lower crankcase and into the timing chain chamber.

The rotating action of the crankshaft causes the air to flow towards the rear of the crankcase and up into the rear section of the right valve rocker arm cover. The air then enters a spring-loaded regulator valve that regulates the amount of air to meet changing operating conditions (Fig.

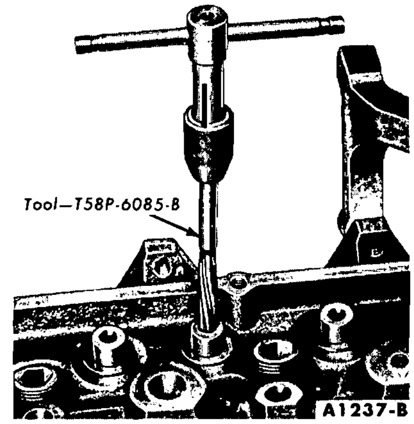

FIG. 14—Valve Rocker Arm Shaft Lubrication

18). The air is then directed to the intake manifold through the crankcase vent hose, tube and fittings.

During idle, intake manifold vacuum is high. The high vacuum overcomes the tension of the spring pressure and moves the valve to the Low Speed Operation position (Fig. 18). With the valve in this position, the ventilating air passes between the valve (jiggle pin) and the outlet port. With the valve in this position, there is minimum ventilation.

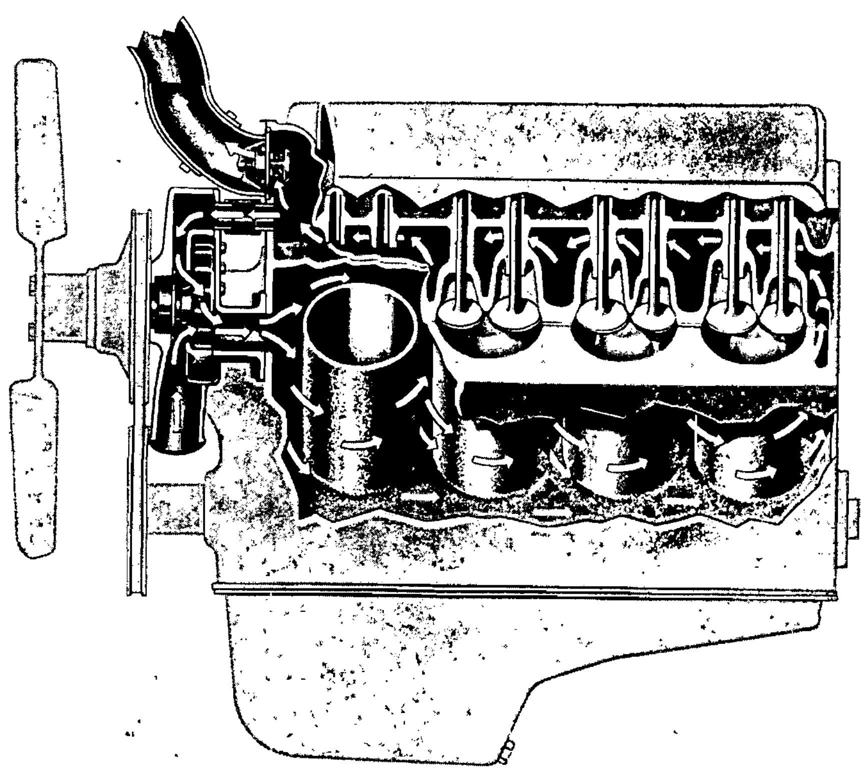

FIG. 15—Typical Cooling System

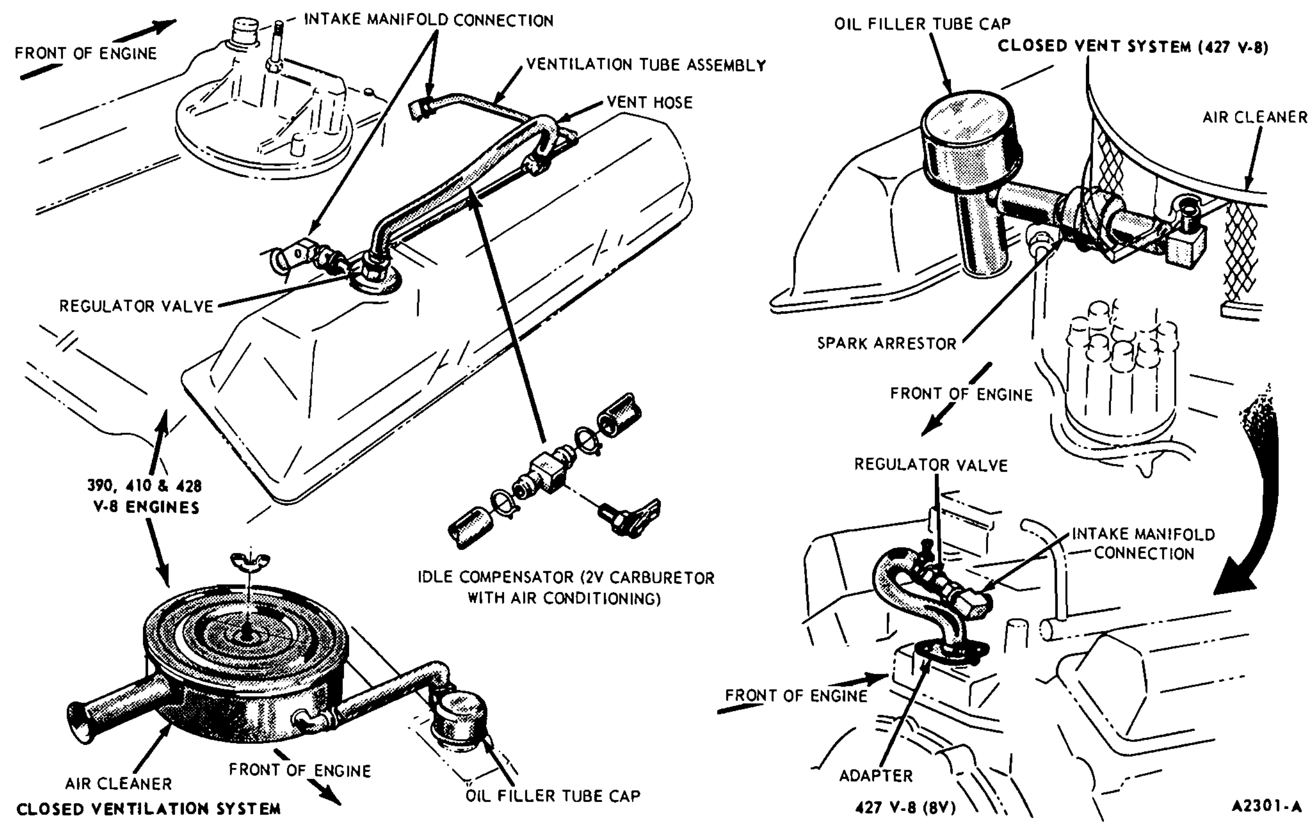

FIG. 16—Positive Crankcase Ventilation System

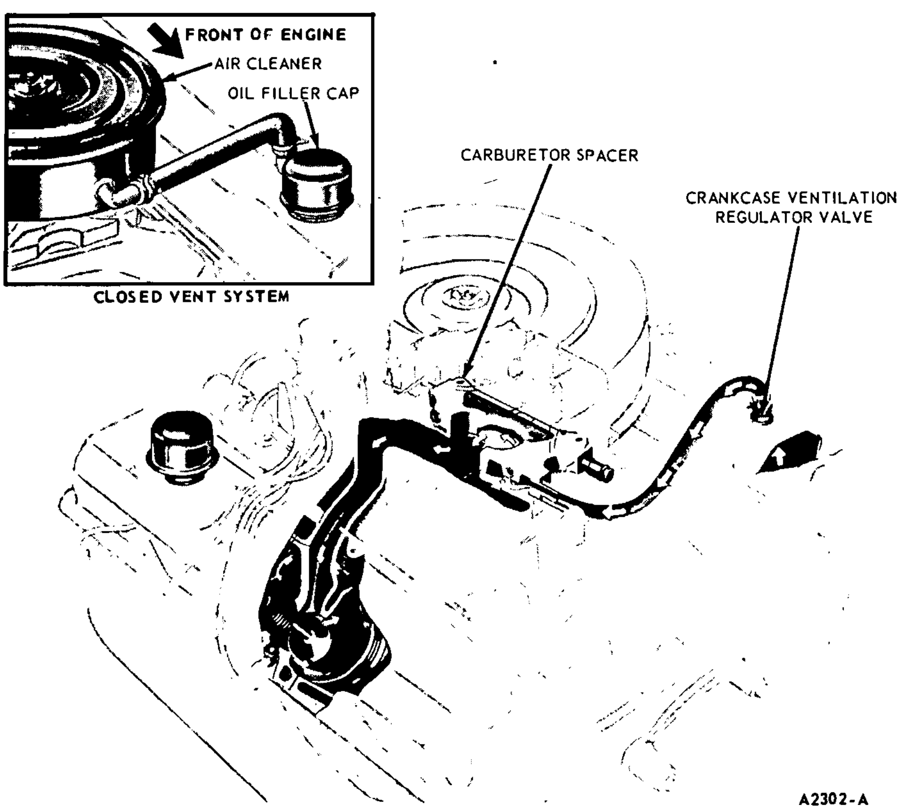

FIG. 17—Positive Crankcase Ventilation System— 390-2-V

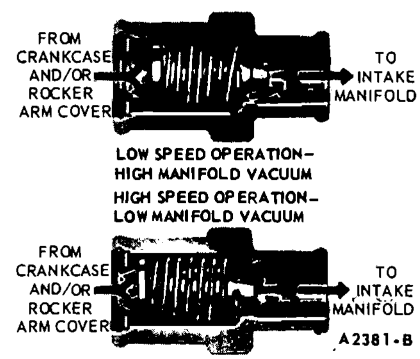

FIG. 18—Positive Crankcase Ventilation Regulator Valve Operation

As engine speed increases and manifold vacuum decreases, the spring forces the valve to the full open position (Fig. 18). This increases the flow of ventilating air.

CLOSED VENTILATION SYSTEM

The closed ventilation system is the same as the open ventilation system except for the following:

The crankcase ventilating air source is the carburetor air cleaner.

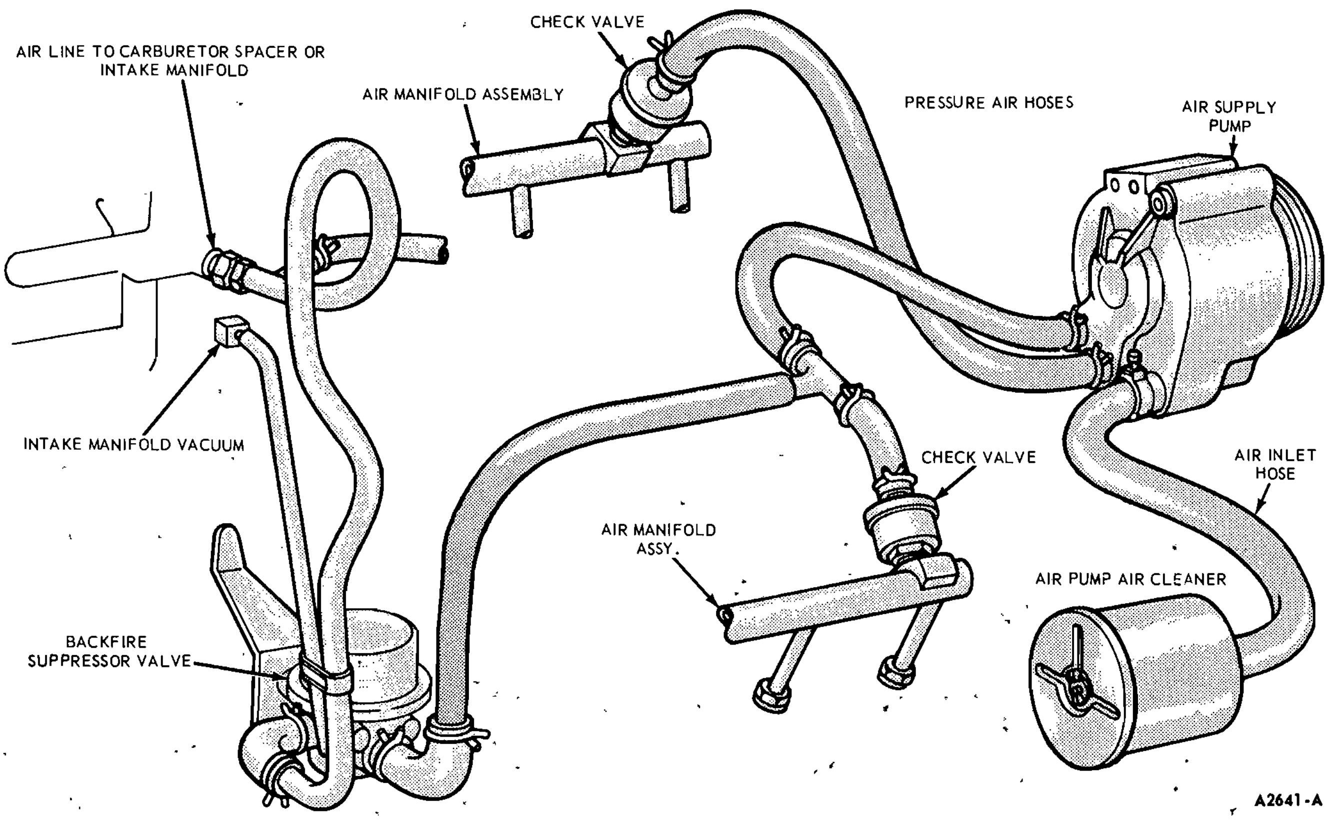

FIG. 19—**Thermactor Exhaust Emission Control System Schematic**

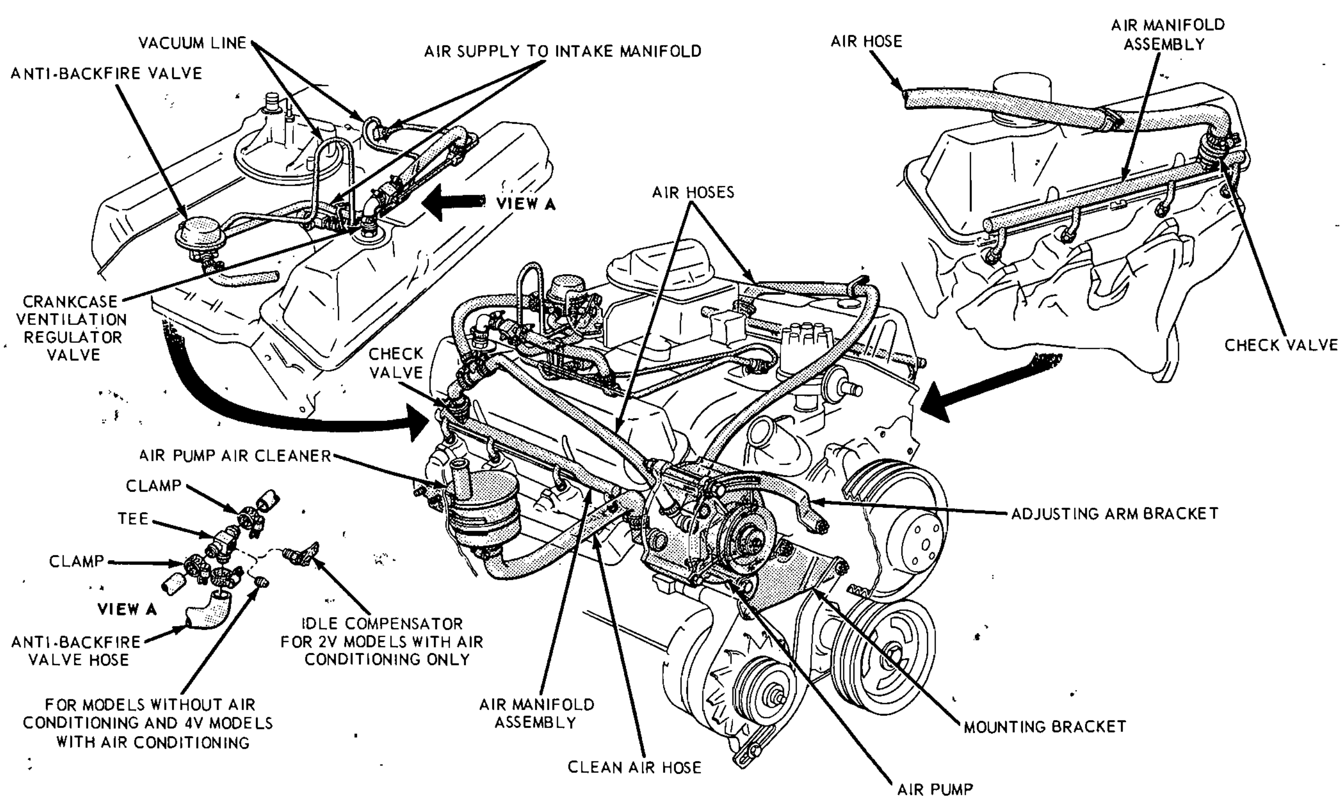

FIG. 20—**Typical Thermactor Installation**

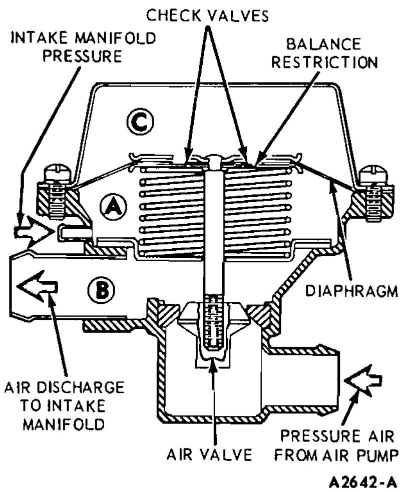

FIG. 21—Backfire Suppressor Valve

The air passes through a hose connecting the air cleaner to the oil filler cap (Fig. 16 or 17). The oil filler cap is sealed at the filler opening to prevent the entrance of atmospheric air. A restriction in the air cleaner at the hose connection, assists the crankcase ventilation regulator valve in maintaining a slight vacuum in the crankcase.

EXHAUST EMISSION CONTROL SYSTEM

The 1967 engines incorporate two different types of exhaust emission control systems.

Both the IMCO and Thermactor systems are designed to reduce the hydrocarbon and carbon monoxide content of gasoline engine exhaust gases. By controlling the amount of contaminants emitted through the exhaust system to an acceptable minimum, air polution is reduced.

THERMACTOR

The Thermactor exhaust emission control system is designed to reduce the hydrocarbon and carbon monoxide content of gasoline engine exhaust gases. By controlling the amount of contaminants emitted through the exhaust system to an acceptable minimum, air pollution is reduced.

Control of exhaust-emitted gases by the Thermactor system is achieved by burning the hydrocarbon and carbon monoxide concentrations in the exhaust ports of the cylinder head. To accomplish this burning of the contaminants, air under pressure is injected into the exhaust outlet ports near each exhaust valve. The oxygen in the air plus the heat of the exhaust gases in each exhaust outlet port induces combustion during the exhaust stroke of the piston. The burned gases then flow out the exhaust manifold into the exhaust system.

The Thermactor system consists of: an air supply pump; a backfire suppressor valve; an air cleaner; a check valve on each cylinder head; an air passage to the exhaust port of each engine cylinder and the connecting air supply hoses and vacuum sensing line.

A schematic of the Thermactor system is shown in Fig. 19. The Thermactor system is shown installed in Fig. 20.

A check valve is incorporated in the inlet air side of the cylinder heads. The check valve prevents a backflow of exhaust gases into the air pump during operating periods when the exhaust back pressure exceeds the air pump delivery pressure.

The pressure air from the air supply pump is connected to the backfire suppressor valve (Fig. 21). Normally the suppressor valve is closed and the air is directed to the check valves and into the cylinder heads.

During engine deceleration periods the suppressor valve opens and air delivery to the cylinder heads is momentarily interrupted and diverted to the intake manifold.

2 IN-CAR ADJUSTMENTS AND REPAIRS

When installing nuts or bolts that must be torqued (refer to Part 8-5 for torque specifications), oil the threads with light weight engine oil. **Do not oil threads that require oil-resistant or water-resistant sealer.**

ENGINE SUPPORTS

The front supports are located on each side of the cylinder block and the rear support is located at the transmission extension housing.

ENGINE FRONT SUPPORT INSULATOR—MERCURY INTERMEDIATE

The engine front support is shown in Fig. 22.

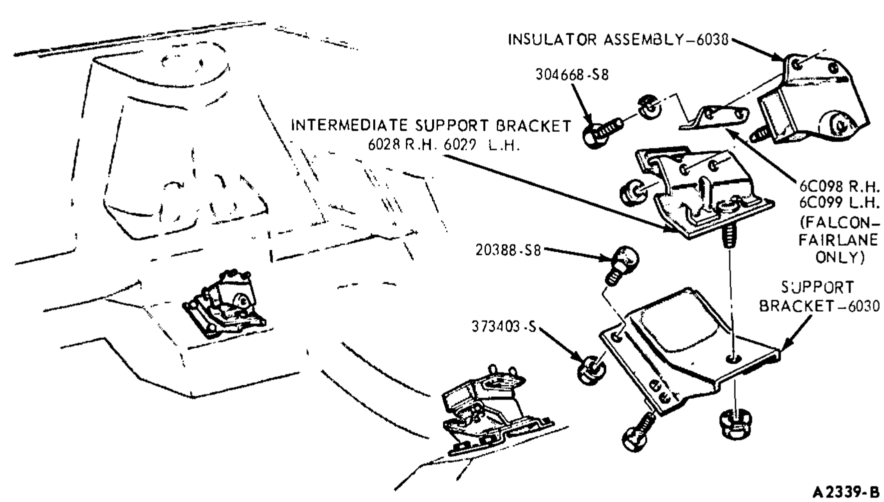

FIG. 22—Engine Front Supports

Removal

1. Position a jack and wood block under the engine oil pan, and raise the engine sufficiently to unload the engine front support insulators.

2. Remove the insulator assembly to engine retaining bolts and lock washers. Remove the intermediate support bracket retaining nuts and washers on both engine supports.

3. Raise the engine about 1 inch and remove the right side insulator assembly. Remove the assembly nuts and separate the insulator from the intermediate support bracket.

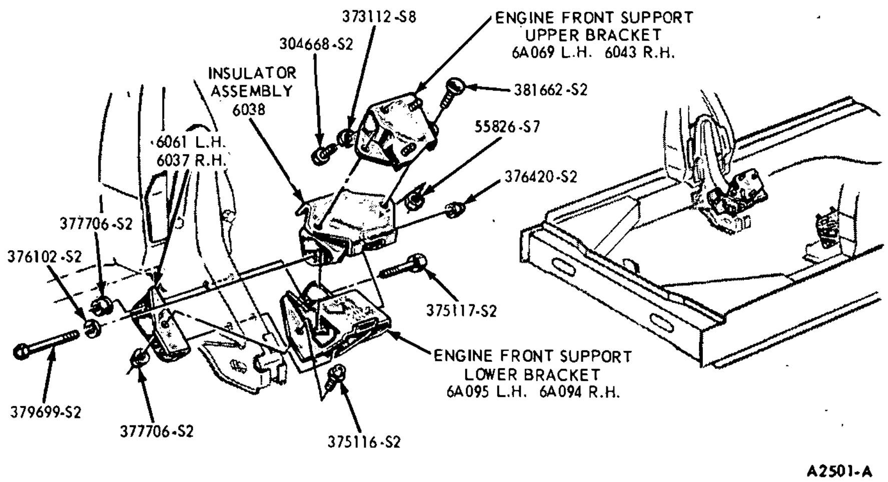

FIG. 23—**Engine Front Supports— Mustang with 390 V-8**

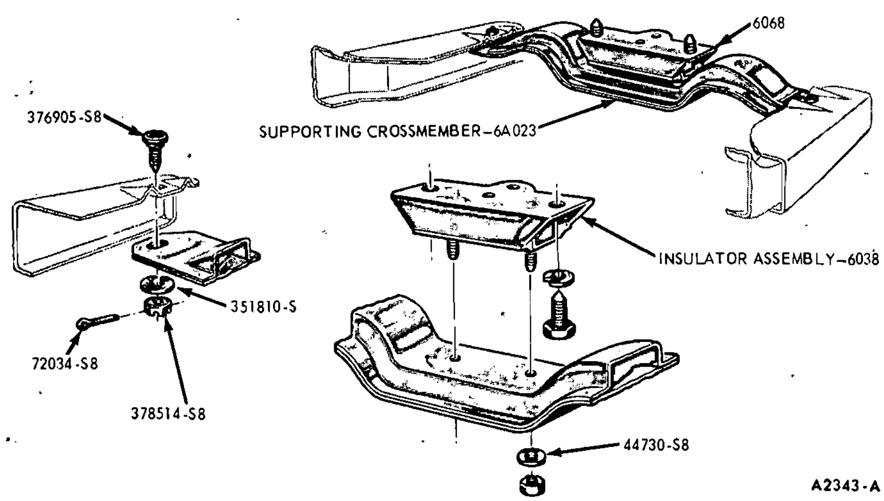

FIG. 24—**Engine Rear Support**

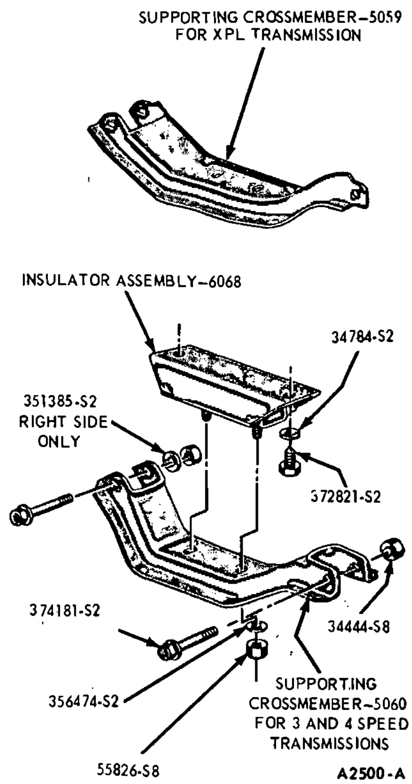

FIG. 25—**Engine Rear Support— Mustang with 390 V-8**

4. On the left side engine support, move the insulator and intermediate support bracket forward, and remove the assembly nuts. Separate the insulator and intermediate support bracket, and remove them from the engine compartment.

Installation

1. On a left side engine support, position the insulator and intermediate support bracket between the engine and frame crossmember bracket. Assemble the insulator and support bracket and torque the nuts to specifications.
2. On a right side engine support, assemble the support insulator to the intermediate support bracket, and torque the nuts to specifications.
3. Position the insulator assembly(ies) to the engine and install the retaining bolts and lock washers. Torque the retaining bolts to specifications.
4. Lower the engine and install the insulator assembly to support bracket retaining nut and washer on both supports. Torque the retaining nuts to specifications.

ENGINE FRONT SUPPORT INSULATOR—FALCON AND FAIRLANE

Engine supports and their service procedures are the same as shown above (Fig. 22).

ENGINE FRONT SUPPORT INSULATOR—MUSTANG AND COUGAR

The engine front support insulators are shown in Fig. 23.

Removal

1. Raise the vehicle on a hoist.
2. Remove the horizontal through bolt, washer and nut, retaining the insulator assembly to the engine front support lower bracket.
3. Position a jack and wood block under the oil pan and raise the engine so the insulator clears the lower bracket.
4. Remove the bolts, washers and nuts retaining the insulator to the engine front support upper bracket.
5. On a right insulator support, position the starter cable and its retaining bracket to one side. Remove the insulator.

Installation

1. Position the insulator to the engine front support upper bracket, and install the retaining bolts, washers and nuts.

On a right insulator, position the starter cable and its retaining bracket before installing the retaining bolts, washers and nuts. Torque to specifications.

2. Lower the engine and install the thru bolt, washer and nut retaining the insulator to the frame bracket. Torque the bolts to specifications.

3. Remove the jack and wood block and lower the vehicle.

ENGINE REAR SUPPORT INSULATOR—MERCURY INTERMEDIATE, FALCON AND FAIRLANE

The engine rear support is shown in Fig. 24.

Removal

1. Position a jack under the transmission extension housing. Remove the insulator assembly to support bracket retaining bolts and nuts. Remove the insulator to transmission extension housing bolts and lock washers.
2. Raise the transmission extension housing slightly to remove the weight of the transmission from the insulator.
3. Remove the support crossmember to side rail cotter pin, nut, bolt and washers. Remove crossmember and rear insulator.
4. Remove nuts and washers and separate insulators from crossmember.

Installation

1. Position the insulators to the crossmember and install the nuts and washers.
2. Position the crossmember and rear insulator and install the crossmember to side rail bolt, washers, nut, and cotter pin.
3. Lower the transmission extension housing.
4. Install the insulator to transmission extension housing bolts and lock washers. Torque all bolts and nuts to specifications. Remove the jack.

ENGINE REAR SUPPORT INSULATOR—MUSTANG AND COUGAR

The engine rear support insulator is shown in Fig. 25.

Removal

1. Raise the vehicle on a hoist.
2. Place a jack under the transmission.
3. Remove the bolts and nuts retaining the crossmember to the side supports and to the engine rear support insulator. Remove the crossmember.
4. Remove the retaining bolts and remove the rear support insulator from the transmission extension housing.

Installation

1. Position the support insulator to the transmission extension housing and install the retaining screws. Torque the screws to specifications.
2. Position the crossmember (note letter R stamped on the flange indicating rear), and install the retaining bolts and nuts at both the side supports and at the rear support. Torque the bolts and nuts to specifications.
3. Remove the jack and lower the vehicle.

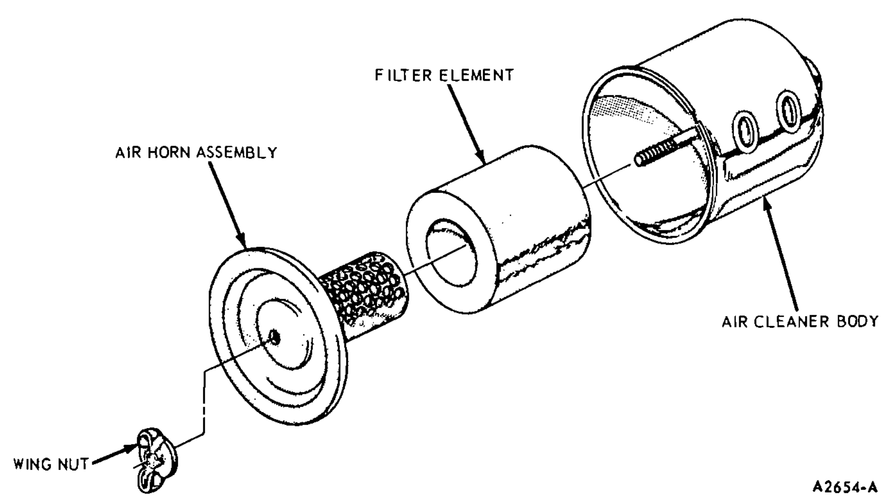

FIG. 26—Thermactor Exhaust Emission System Air Cleaner—Typical

THERMACTOR AIR PUMP DRIVE BELT ADJUSTMENT

The air supply pump drive belt should be properly adjusted at all times. A loose drive belt causes improper air pump operation. A belt that is too tight places a severe strain on the air pump bearings.

Properly tensioned drive belts minimize noise and also prolong service life of the belt. Therefore, it is recommended that a belt tension gauge be used to check and adjust the belt tension. **Any belt that has operated for a minimum of 10 minutes is considered a used belt, and, when adjusted, it must be adjusted to the reset tension shown in the specifications.**

THERMACTOR AIR PUMP BELT TENSION

1. Install the belt tension tool (T63L-8620-A) on the drive belt and check the tension following the instructions of the tool manufacturer. Compare the belt tension to the specified belt tension (Part 8-5) and adjust as necessary.
2. If adjustment is necessary, loosen the air pump mounting and adjusting arm bolts (Fig. 20). Move the air pump toward or away from the engine until the correct tension is obtained. **Use a suitable bar and pry against the pump rear cover** to hold belt tension while tightening the mounting bolts. **Do not pry against the pump housing.** Remove the gauge. Tighten the air pump adjusting arm and mounting bolts. Install the tension gauge and check the belt tension.

THERMACTOR AIR PUMP—AIR CLEANER ELEMENT REPLACEMENT

1. Remove the cover assembly (Fig. 26). Remove the filter element from the cover assembly.
2. Wipe the cover assembly and air cleaner with a clean, lint-free cloth to remove any accumulated dirt or foreign matter. Under extremely dirty conditions it may be necessary to wash both the cover and body in low-volatility mineral spirits. Be sure the parts are dry before installing them.
3. **The filter element is not cleanable. Refer to the 1967 Passenger Car Maintenance Manual for the recommended replacement interval.** Place a new filter element on the cover assembly. Position the assembled cover and filter element in the air cleaner body (Fig. 27).

THERMACTOR AIR CLEANER

REMOVAL

1. Note the position of the cover with respect to the vehicle (or engine) and with respect to the air cleaner mounting bracket.
2. Disconnect the air hose from the air cleaner body. Remove the air cleaner mounting bracket screws and remove the air cleaner.

INSTALLATION

1. Position the air cleaner and mounting bracket assembly in the same way that it was previously installed, and install the mounting bracket screws.
2. Connect the air hose to the air cleaner body.

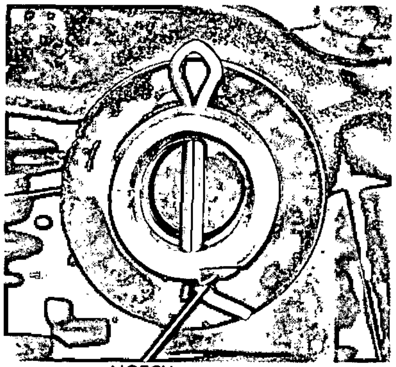

FIG. 27—Typical Installation Identification Mark—Rocker Arm Shaft Assembly

DRIVE BELT REPLACEMENT

1. Loosen the air supply pump front and rear adjusting arm nuts and bolts (Fig. 20). Loosen the air supply pump to mounting bracket nut and bolt, and push the air pump towards the cylinder block. Remove the drive belt.
2. Install a new drive belt. With a suitable bar, **pry against the rear cover of the air pump** to obtain the specified belt tension (refer to Part 8-5, and tighten the front and rear adjusting arm bolts and nuts. **Do not pry against the pump housing.** Adjust the belt tension (refer to Part 8-5) as necessary. **Always use a belt tension gauge (Tool T63L-8620-A) to check belt tension.**
3. Tighten the air supply pump to mounting bracket bolt and nut.

BACKFIRE SUPPRESSOR VALVE

REMOVAL

Disconnect the air and vacuum hoses at the backfire suppressor valve body (Fig. 20). Remove the valve to mounting bracket bolts and separate the valve from the mounting bracket.

INSTALLATION

Position the backfire suppressor valve on the mounting bracket, and install the attaching bolts. Be sure the valve is positioned properly (Fig. 20), and connect the air and vacuum hoses.

THERMACTOR CHECK VALVE REPLACEMENT

1. Disconnect the air supply hose at the valve. Use a 1 1/4 inch crow-foot wrench to unscrew the check valve assembly (the valve has a standard, right-hand pipe thread).
2. Clean the threads on the air manifold adapter with a wire brush. Install the check valve and torque it to specifications. Connect the air supply hose.

THERMACTOR AIR MANIFOLD

REMOVAL

1. Disconnect the air supply hose at the check valve and position the hose out of the way.
2. Loosen all of the air manifold to cylinder head tube coupling nuts (compression fittings). Then unscrew each one until it is free of the cylinder head. Grasp the air manifold at each end and pull it away from the cylinder head. Follow the same procedure to remove the other air manifold, if the engine is so equipped.

INSTALLATION

1. Position the air manifold(s) on the cylinder head. Be sure all the tube coupling nuts are aligned with the cylinder head. Screw each coupling nut into the cylinder head 1 to 2 threads. Tighten the tube coupling nuts.
2. Connect the air supply hose to the air manifold.

THERMACTOR AIR NOZZLE REPLACEMENT

Normally, air nozzles would be replaced as necessary during cylinder head overhaul. A nozzle may be replaced without removing the cylinder head by removing the air manifold and using a hooked tool to pull the nozzle.

For cleaning and inspection of the air nozzles, refer to Part 8-1, Section 3. Additionally, the air nozzles could be inspected for badly eroded tips with the aid of a mirror, when the exhaust manifold(s) is removed.

AIR PUMP DRIVE PULLEY REPLACEMENT

1. Loosen the air supply pump adjusting arm and mounting bolts and nuts to relieve the belt tension.
2. Remove the drive pulley attaching bolts and pull the drive pulley off the air pump shaft.
3. Position the drive pulley on the air supply pump shaft, and install the retaining bolts. Torque the bolts in sequence, across from each other, to specifications.
4. Position the drive belt and adjust the belt tension (Part 8-5) to specifications. Tighten the adjusting arm and mounting bolts and nuts.

THERMACTOR AIR SUPPLY PUMP

REMOVAL

1. Disconnect the air inlet and outlet hoses at the air pump.
2. Loosen the front and rear adjusting arm to air pump and air pump to mounting bracket bolts to relieve the drive belt tension.
3. Disengage the drive belt. Remove the mounting bolts and air pump.

REPAIR

For disassembly and repair procedures, refer to Part 8-1, Section 2 of this part.

INSTALLATION

1. Position the air pump on the mounting bracket and install the mounting bolt and nut.
2. Place the drive belt in the pulleys and attach the front and rear adjusting arm to the air pump. Adjust the drive belt tension to specifications and tighten the adjusting arm and mounting bolts.
3. Connect the air inlet and outlet hoses to the air pump.

AIR PUMP RELIEF VALVE REPLACEMENT

Do not disassemble the air pump to replace the relief valve, but remove it from the engine.

1. Position Tool T66L-9A486-D on the air pump and remove the relief valve with the aid of a slide hammer (T59L-100-B).
2. Position the relief valve in the pump housing and hold Tool T66L-9A486-B on the relief valve. Use a hammer to tap the tool lightly until the relief valve is seated.

RELIEF VALVE PRESSURE SETTING PLUG REPLACEMENT

1. Remove the relief valve silencer.
2. Using a small screwdriver, bend the three locking tabs inward and remove the plug.
3. Before installing the new plug, be sure that the plug is the correct one. The correct plug for this engine should be color coded green.
4. Insert the plug in the relief valve hole.

5. Using a 1/4 inch diameter rod, push the plug in until the three locking tabs are spread out on the under side of the relief valve cover. The three depth control tabs should be seated on the top of the relief valve cover.

6. Install the relief valve silencer.

VALVE ROCKER ARM SHAFT ASSEMBLY

REMOVAL

1. Remove the air cleaner.

2. If equipped with a Thermactor exhaust emission control system, disconnect the air hoses as necessary for accessibility and position them out of the way.

3. Disconnect the spark plug wires at the spark plugs. Remove the wires from the bracket on the valve rocker arm cover(s) and position the wires out of the way.

To remove the right valve rocker arm cover, remove the carburetor choke air heat tube, and the heat chamber air inlet tube (except 427 V-8). Remove the crankcase ventilation regulator valve or vent tube from the rocker cover.

4. Remove the valve rocker arm cover(s).

If the left cover is removed, position the wire loom out of the way.

5. Start at the No. 4 cylinder and loosen the valve rocker arm shaft support bolts in sequence, two turns at a time. After the bolts are all loosened, remove the valve rocker arm shaft assembly and the oil baffle plate. On the left cylinder head start at the No. 5 cylinder and follow the same procedure on the valve rocker arm shaft support bolts. **This procedure must be followed to avoid damage to the rocker shaft.**

INSTALLATION

1. Apply Lubriplate to the pad end of the rocker arms, to the tip of the valve stems, and to both ends of the push rods.

2. Crank the engine until the No. 1 piston is on TDC at the end of the compression stroke.

3. Rotate the crankshaft damper an additional 45° (identified by XX on the damper).

4. Position the baffle plate and the valve rocker arm shaft assembly(ies) on the cylinder heads with the valve push rods in place and the rocker shaft support bolts finger-tight. **Be sure the shaft is positioned so that the oil holes are to the bottom. Also, the identification notch (Fig. 27) must be downward and toward the front on the right bank, or toward the rear on the left bank.**

5. On the right cylinder head, start at the No. 4 cylinder and tighten the bolts in sequence, two turns at a time, until the supports fully contact the cylinder head. Torque the bolts in sequence to specifications.

6. On the left cylinder head, start at the No. 5 cylinder and follow the same procedure for the left valve rocker arm shaft support bolts. The additional time consumed in this procedure will permit the hydraulic lifters (if so equipped) to leak down. This will minimize the possibility of bending the push rods, valves or rocker arms. **Be sure that the hydraulic lifters have leaked down to their normal operating position before cranking the engine. This is necessary in order to avoid possible damage to the valves, push rods or valve rocker arms.**

7. On engines with mechanical tappets, perform a preliminary (cold) valve lash adjustment (Part 8-1, Section 2) **if any part of the valve train components has been replaced; i.e., push rod, valve, rocker arm, etc.** Temporarily lay the valve rocker arm covers in place and temporarily connect the spark plug wires. Install the air cleaner and operate the engine for 30 minutes at 1200 rpm to stabilize engine temperatures. Remove the air cleaner and the valve rocker arm covers and perform a hot valve lash adjustment with the engine idling (Part 8-1, Section 2).

8. Clean the valve rocker arm cover(s). Apply oil-resistant sealer to one side of new cover gasket(s). Lay the cemented side of the gasket(s) in place in the cover(s).

9. Position the cover(s) on the cylinder head(s). Make sure the gasket seats evenly all around the head. Install the bolts (and the wire loom clamps on the left cover). The cover is tightened in two steps. Torque the bolts to specifications. Two minutes later, torque the bolts to the same specifications.

On a vehicle with power brakes, if the left cover was removed, connect the brake booster vacuum line to the intake manifold. If equipped with a Thermactor exhaust emission control system, connect the air hoses.

If the right cover was removed, install the carburetor choke air heat tube, and connect the automatic choke heat chamber air inlet tube (except 427 V-8). Install the crankcase ventilation regulator valve in the rocker cover.

10. Connect the spark plug wires. Install the air cleaner.

DISASSEMBLY

1. Remove the cotter pins from each end of the valve rocker arm shaft. Remove the flat washer and spring washer from each end of the shaft.

2. Slide the rocker arms, springs and supports off the shaft. Be sure to identify all the parts.

3. If it is necessary to remove the plugs from each end of the shaft, drill or pierce one plug. Then insert a steel rod through the drilled plug and knock out the plug on the opposite end. Working from the open end, knock out the remaining plug.

CLEANING AND INSPECTION

Refer to Part 8-1, Section 3 for the cleaning and inspection procedures.

REPAIRS

Refer to Part 8-1, Section 2 for the repair procedures.

ASSEMBLY

1. Oil all the moving parts with engine oil. Apply Lubriplate to the pad of the valve rocker arms.

2. If the plugs were removed from the ends of the shaft, use a blunt tool or large diameter pin punch, and install a plug, cup side out, in each end of the rocker arm shaft.

3. Install the rocker arms, supports and springs in the order shown in Figs. 28 or 29. **Be sure the oil holes in the shaft are facing downward. When properly assembled, the identification notch (Fig. 27) on the right rocker shaft assembly must be facing downward and toward the front of the engine. On the left rocker shaft assembly, the notch is downward and toward the rear.** Complete the assembly by installing the remaining flat washer, spring washer and cotter pin.

INTAKE MANIFOLD

REMOVAL

1. Drain the cooling system. Remove the engine hood. Remove the air cleaner.

Disconnect the accelerator cable at the carburetor. Remove the accelerator retracting spring. Remove the accelerator cable bracket from the intake manifold and position the cable and bracket assembly out of the way.

On a vehicle with an automatic transmission, remove the kickdown

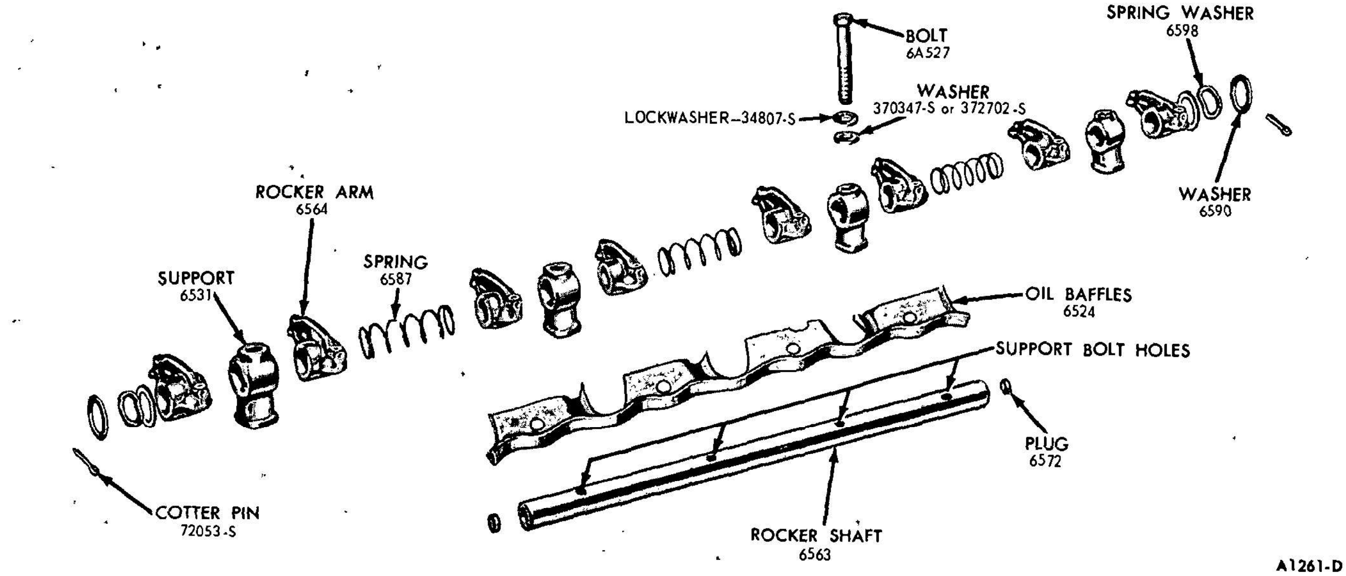

FIG. 28—Valve Rocker Arm Shaft Assembly—Hydraulic Valve Lifters

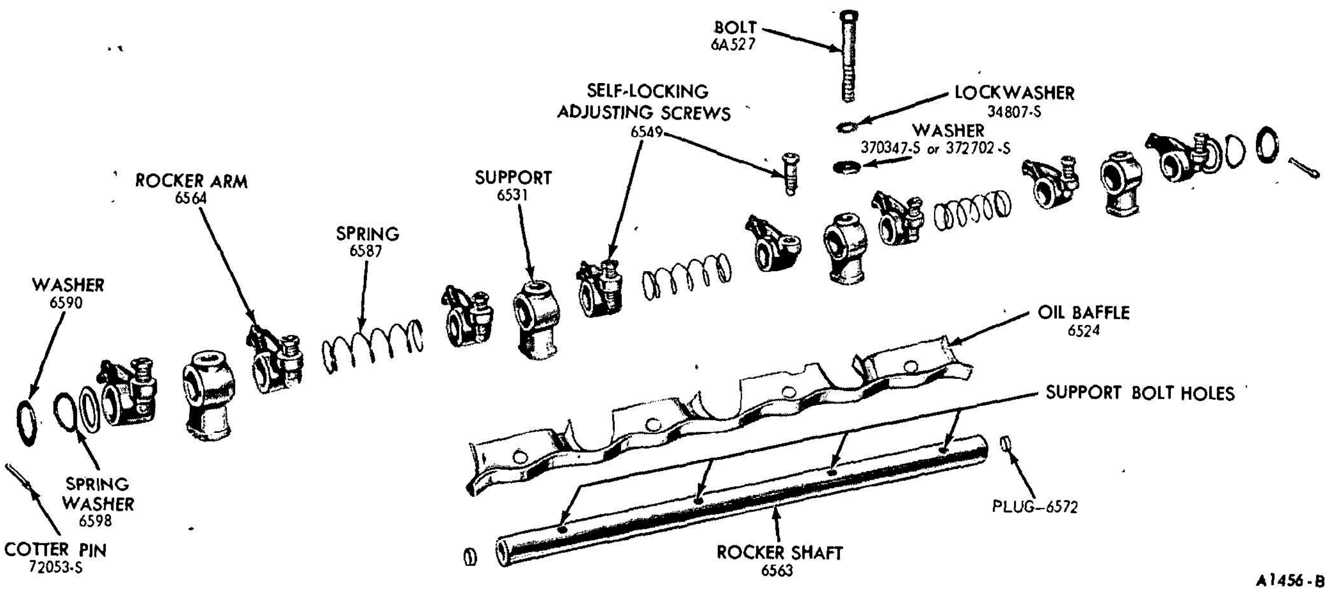

FIG. 29—Valve Rocker Arm Shaft Assembly—Mechanical Valve Tappets

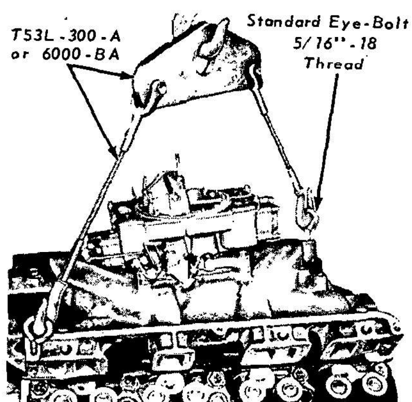

FIG. 30—Typical Intake Manifold Removal or Installation

rod retracting spring. Disconnect the kickdown rod at the carburetor, and the spacer vacuum line.

2. Disconnect the coil high tension lead and the primary wire at the distributor. Disconnect the oil pressure sending unit wire at the sending unit (and oil temperature sending unit wire on the 427 V-8 engine if so equipped).

3. Disconnect the spark plug wires at the spark plugs and remove the wires from the ignition harness brackets on the valve rocker arm covers. Remove the distributor cap and spark plug wire assembly. Disconnect the distributor vacuum line at the distributor (except 427 V-8).

4. Remove the carburetor fuel inlet line at the fuel filter, and the automatic choke air heat tube and the heat chamber air inlet tube (except 427 V-8). Disconnect the brake booster vacuum line at the intake manifold and at the flexible hose. Remove the vacuum line.

5. Remove the distributor hold down bolt and clamp and remove the distributor.

6. Disconnect the radiator upper hose at the thermostat housing. Disconnect the heater hose at the rear of the carburetor spacer (390 V-8 engines) and from the intake manifold on the other engines. Disconnect the water temperature sending unit wire

at the sending unit. Disconnect the heater hose at the water pump and remove it from the automatic choke housing bracket.

7. Slide the clamp on the water pump bypass hose toward the water pump.

8. Remove the crankcase ventilation regulator valve from the right valve rocker arm cover. If equipped with Thermactor exhaust emission control system, disconnect the air lines and hoses as necessary for accessibility. Remove the valve rocker arm covers. Position the wire loom attached to the left valve rocker arm cover out of the way.

9. Refer to Valve Rocker Arm Shaft Assembly—Removal and remove the valve rocker arm shaft assemblies by following step 4.

10. Remove the valve push rods in sequence and place them in a rack so they can be installed in the same location.

11. Remove the intake manifold retaining bolts.

12. Install standard eye bolts with 5/16-18 threads in the left front and right rear rocker arm cover screw holes and attach the engine lifting sling (Fig. 30).

13. Use a hoist to raise the manifold. Remove the intake manifold and radiator supply tank (if so equipped) as an assembly. Remove the intake manifold gaskets and seals.

14. If the intake manifold assembly is to be disassembled, remove the thermostat housing, thermostat and gasket. Remove the carburetor, spacer and gaskets. Remove the coolant temperature sending unit.

On 390 and 427 V-8 engines remove the crankcase ventilation inlet tube and fittings.

CLEANING AND INSPECTION

Refer to Part 8-1, Section 3 for the cleaning and inspection procedures.

INSTALLATION

The intake manifold assembly is shown in Fig. 31.

Engines With Hydraulic Valve Lifters

1. If the intake manifold assembly was disassembled, install the carburetor, spacer and gaskets. Coat the thermostat gasket with water-resistant sealer and place it in position on the intake manifold. Install the thermostat and thermostat housing. Coat the coolant temperature sending unit threads with electrical-conductive sealer, and install the sending unit in the intake manifold.

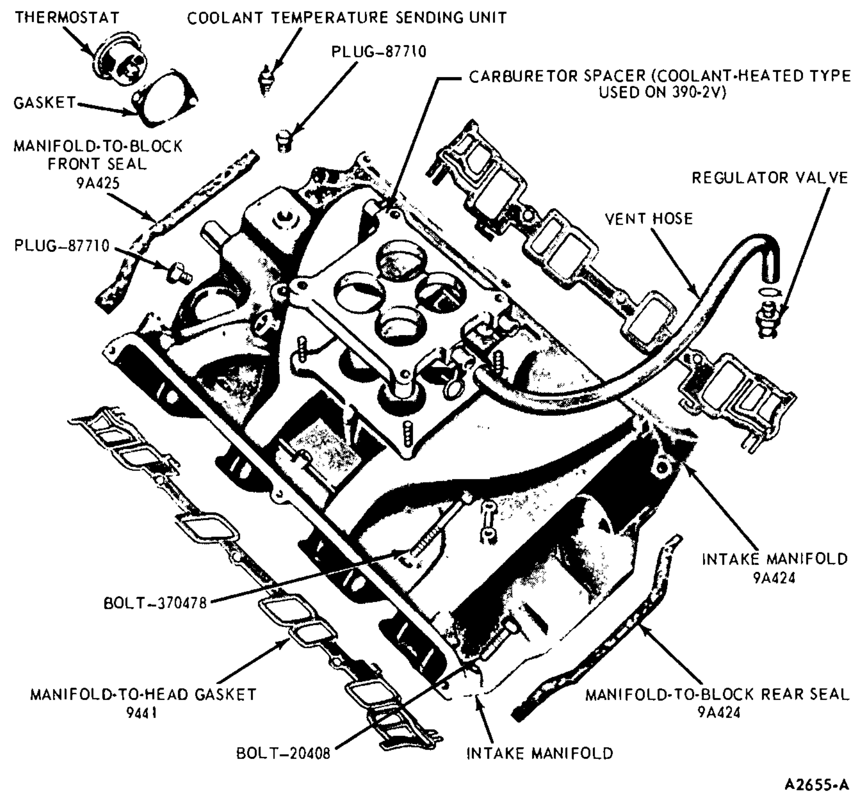

FIG. 31—**Typical Intake Manifold Assembly**

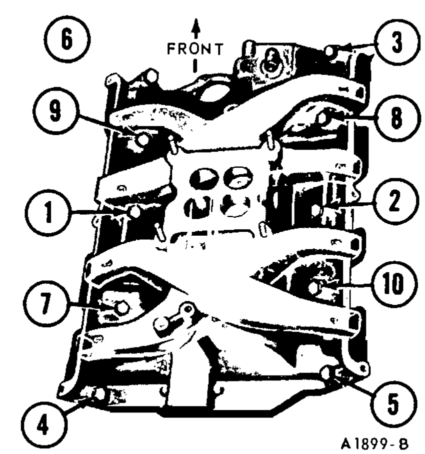

FIG. 32—**Intake Manifold Torque Sequence**

2. Clean the mating surfaces of the intake manifold, cylinder heads and cylinder block. Use a suitable solvent to remove all traces of oil.

3. Coat the intake manifold and cylinder block seal surfaces with a quick-setting seal adhesive. Apply a non-hardening sealer to the mating lines of the cylinder heads and cylinder block.

4. Position new seals on the cylinder block and new gaskets on the cylinder heads. **Be sure the seals are properly positioned during installation as the adhesive sticks to the seals immediately on contact.** Position the manifold gasket slots over the end tabs on the seals. Coat these four connections with a non-hardening sealer. Be sure the holes in the gaskets are aligned with the holes in the cylinder heads.

5. Install the eye bolts in the intake manifold and attach the engine lifting sling.

6. Use a hoist to lower the intake manifold on the engine (Fig. 30), and at the same time engage the coolant outlet nipple with the water pump bypass hose.

7. **After the intake manifold is in place, run a finger around the seal area to make sure the seals are in place. If the seals are not in place, remove the intake manifold and reposition the seals.**

8. Be sure the holes in the manifold gaskets and manifold are in alignment. Coat the underside of the heads of the retaining bolts with oil resistant, non-hardening sealer. Install the manifold retaining bolts and torque the bolts to specifications in sequence as shown in Fig. 32.

9. Remove the engine lifting sling and eye bolts, and install the distributor.

10. Slide the water pump bypass hose clamp into position. Connect the coolant temperature sending unit wire. Connect the heater hoses and the radiator upper hose. Install the water pump heater hose in the automatic choke housing bracket.

11. Refer to Valve Rocker Arm Shaft Assembly Installation, and install the valve rocker arm shaft assembly by following steps 1 thru 7.

12. Rotate the crankshaft damper until the No. 1 piston is on TDC at the end of the compression stroke. Position the distributor in the block with the rotor at the No. 1 firing position and the points open. Install the hold down clamp.

13. Clean the valve rocker arm covers. Apply oil-resistant sealer to one side of new cover gaskets. Lay the cemented side of the gaskets in place in the covers. Install the valve rocker arm covers, bolts and wire loom clamps. Tighten the covers in two steps. First, torque the bolts to specifications. Two minutes later, torque the bolts to the same specifications.

14. Install the positive crankcase ventilation system components. If equipped with Thermactor exhaust emission control system, connect the hoses.

15. Connect the brake booster vacuum line and connect the flexible hose.

16. Using a new clamp, install the carburetor fuel inlet line at the fuel filter; then (except for 427 V-8) connect the distributor vacuum line. Install the automatic choke air heat tube and except on 427 engines, the air inlet tube.

17. Install the distributor cap. Connect the spark plug wires.

18. Connect the oil pressure sending unit wire, coolant temperature sending unit wire, coil high tension lead and coil primary wire.

Install the accelerator cable bracket on the intake manifold. Connect the accelerator cable to the carburetor. Install the accelerator retracting spring.

On a vehicle with an automatic transmission, connect the kickdown rod. Install the kickdown rod retracting spring, and the spacer vacuum line.

19. Fill and bleed the cooling system.

20. Install the air cleaner, start the engine, and check and adjust the ignition timing. Operate the engine until engine temperatures have stabilized and adjust the engine idle speed and idle fuel mixture.

21. Install the engine hood.

Engines with Mechanical Valve Tappets

1. Follow steps 1 thru 10 under Engines With Hydraulic Valve Lifters.

2. Refer to Valve Rocker Arm Shaft Assembly Installation and install the valve rocker arm shaft assemblies by following steps 1 thru 6.

3. Install the carburetor fuel inlet line. Install the automatic choke air heat tube.

4. Install the distributor, following step 12 under Engines With Hydraulic Valve Lifters.

5. Temporarily lay the valve rocker arm covers in place. Install the positive crankcase ventilation system components. If equipped with Thermactor exhaust emission control system, connect the hoses.

6. Install the brake booster vacuum line.

7. Install the distributor cap. Temporarily connect the spark plug wires.

8. Connect the oil pressure sending unit, coil high tension lead, coolant temperature sending unit, and coil primary wire.

Install the accelerator cable bracket on the intake manifold. Connect the accelerator cable to the carburetor. Install the accelerator retracting spring.

On a vehicle with automatic transmission, connect the kickdown rod. Install the kickdown rod retracting spring, and the carburetor spacer vacuum line.

9. Fill and bleed the cooling system.

10. Install the air cleaner, start the engine, and check and adjust the ignition timing. Operate the engine until engine temperatures have stabilized. Adjust the engine idle speed and idle fuel mixture. Remove the valve rocker arm covers, and perform a hot valve lash adjustment with the engine idling (Part 8-1, Section 2).

11. Turn the engine off. Clean the valve rocker arm covers. Apply oil-resistant sealer to one side of new cover gaskets. Lay the cemented side of the gaskets in place in the covers. Install the valve rocker arm covers, bolts, and wire loom clamps. Tighten the covers in two steps. First, torque the bolts to specifications. Two minutes later, torque the bolts to the same specifications. Install the crankcase ventilation regulator valve in the right valve rocker cover. Install the spark plug wires.

12. Install the engine hood.

EXHAUST MANIFOLDS

REMOVAL—390 V-8

1. Disconnect the exhaust manifold from the muffler inlet pipe.

2. Remove the automatic choke air heat tube and air inlet tube from the right exhaust manifold, and exhaust control valve assembly.

3. Remove the retaining bolts and tab washers and remove the exhaust manifolds.

REMOVAL—427 V-8

1. Remove the exhaust manifold retaining bolts that are accesible from the top of the engine.

To remove the left exhaust manifold, remove the clutch pedal to equalizer rod lower adjusting nut. Remove the automatic choke air heat tube.

2. Raise the vehicle. Remove the remaining manifold retaining bolts.

To remove the left exhaust manifold, remove the equalizer inner bracket from the engine and the equalizer bar. Disconnect the retracting spring and release rod. Position the equalizer bar out of the way.

To remove the right exhaust manifold, remove the idler arm to chassis bolts and lower the idler arm assembly. Disconnect the engine front support insulators at the frame. Raise the engine approximately 1 or 2 inches to provide necessary clearance to remove the right manifold.

3. Disconnect the muffler inlet pipe at the exhaust manifold and remove the exhaust manifolds.

On the right exhaust manifold, remove the exhaust control valve assembly.

CLEANING AND INSPECTION

Refer to Part 8-1, Section 3 for the cleaning and inspection procedures.

INSTALLATION—390 V-8

1. Clean the mating surfaces of the exhaust manifold and cylinder head. Scrape the gasket material from the mounting flange of the exhaust manifold and muffler inlet pipe, and exhaust control valve assembly.

2. Apply graphite grease to the cylinder head mating surface of the exhaust manifold.

3. Position the exhaust manifold on the cylinder head and install the retaining bolts and tab washers. Working from the center to the ends,

torque the retaining bolts to specifications. Lock the bolts by bending one tab of the washer over a flat on the bolt.

4. Install the automatic choke air heat tube and air inlet tube on the right exhaust manifold.

5. Position new gaskets on both sides of the exhaust control valve assembly, and install between the muffler inlet pipe and the exhaust manifold. Install and torque the retaining nuts to specifications.

6. Start the engine and check for exhaust leaks.

INSTALLATION—427 V-8

1. Clean the muffler inlet pipe gasket surfaces.

On a right manifold, clean both sides of the exhaust control valve assembly.

2. Position the manifold to the cylinder and install the bolts accessiable from beneath the engine. Working from the center to the ends, torque the retaining bolts to specifications. Lock the bolts by bending one tab of the washer over a flat on the bolt.

If the right manifold was removed, lower the engine and install the front insulator lock washers and nuts. Torque the nuts to specifications. Position and install the idler arm assembly. Torque the retaining bolts to specifications.

If the left manifold was removed, position the equalizer bar to the outer bracket. Position the release rod and connect the retracting spring. Install the equalizer inner bracket.

3. On the left manifold, position a new gasket to the manifold and connect the muffler inlet pipe to the manifold. Torque the nuts to specifications.

On the right manifold, place new gaskets on both sides of the exhaust control valve and position it over the inlet pipe studs on the manifold. Connect the muffler inlet pipe to the manifold and torque the nuts to specifications.

4. Lower the vehicle and install the remaining manifold retaining bolts. Working from the center to the ends, torque the retaining bolts to specifications. Lock the bolts by bending one tab of the washer over a flat on the bolt.

If the left manifold was removed, install the clutch pedal to equalizer rod lower adjusting nut. Install the automatic choke air heat tube.

5. Start the engine and check for exhaust leaks.

POSITIVE CRANKCASE VENTILATION

REMOVAL

1. Remove the vent hose (closed system only) from the air cleaner and/or oil filler tube breather (Fig. 16 or 17). Remove the carburetor air cleaner.

2. Disconnect the inlet vent tube assembly at the two elbow fittings on the intake manifold of 390-4V engines. Disconnect the vent hose at the carburetor spacer on 390-2V and 427-4V engines, or at the rear of the intake manifold on 427-8V engines. Grasp the crankcase ventilation regulator valve and pull it straight upwards and out of the grommet in the right valve rocker arm cover of 390 engines.

3. Remove the inlet hose and separate the hose from the regulator valve (all engines).

CLEANING AND INSPECTION

Refer to Part 8-1, Section 3 for cleaning and inspection procedures on the inlet and vent hoses, carburetor spacer (390-2V only), and breather cap connection. **Do not clean the regulator valve. It should be replaced at the specified interval.**

INSTALLATION

1. Install the inlet hose on the regulator valve. Install the inlet hose.

2. Install the crankcase ventilation regulator valve in the right valve rocker arm cover, and connect the inlet vent tube assembly at the two elbow fittings on the intake manifold of 390-4V engines. Connect the inlet hose to the carburetor spacer of 390-2V and 427-4V engines and rear of the intake manifold on 427-8V engines. Be sure the grommet is properly seated around the regulator valve and valve rocker arm cover on 390 engines.

3. Install the air cleaner. Install the breather cap vent hose, if equipped with a closed emission system.

CYLINDER HEADS

REMOVAL

If a cylinder head is to be replaced, follow the procedures under Cylinder Head Disassembly and Assembly, and transfer all valves, springs, spark plug, etc., to the new cylinder head. On a 427 V-8, if the left cylinder head is to be replaced, remove the fuel filter mounting bracket from the old cylinder head and install it on the new cylinder head. Clean and inspect all parts and reface the valves (refer to Part 8-1) before assembling the used parts to the new cylinder head. Check all assembly clearances.

1. If equipped with Thermactor exhaust emission control system, disconnect the air lines and hoses as necessary for accessibility. Remove the intake manifold, positive crankcase vent system components (if applicable), carburetor and thermostat housing (or radiator supply tank) as an assembly following the procedure under Intake Manifold Removal.

2. On the 390 V-8, disconnect the exhaust manifold(s) at the muffler inlet pipe(s). Remove the exhaust control valve. Leave the manifold(s) attached to the cylinder head(s).

On the 427 V-8, remove the exhaust manifold to cylinder head retaining bolts. Refer to Exhaust Manifold Removal. Leave the manifold(s) attached to the muffler inlet pipes, and secure them to the car frame with wire.

3. If the left cylinder head is to be removed, remove the ignition coil, engine identification tag, and on 427 engines, the fuel filter.

Remove the power steering pump mounting bracket bolts, and position the power steering pump and bracket assembly out of the way. **Leave the fluid lines attached to the power steering pump.**

On a vehicle with air conditioning, remove the compressor mounting bracket bolts and position the compressor out of the way.

4. Remove the cylinder head bolts.

5. Do not pry the cylinder head(s) loose from the cylinder block. Lift the cylinder head(s) off the block. Remove and discard the cylinder head gasket. Remove the baffle plate.

INSTALLATION

1. Clean the cylinder head and cylinder block gasket surfaces.

On the 427 V-8, clean the exhaust manifold gasket surfaces.

2. Inspect the cylinder head, following the procedures in Part 8-1, Section 3. **If the cylinder head was removed for a cylinder head gasket replacement, check the flatness of the cylinder head and block gasket surfaces (Part 8-1, Section 3).**

3. On a 427 engine apply cylinder head gasket sealer to both sides of a new gasket. All other engines

use a specially treated composition gasket. **Do not apply sealer to a composition gasket.** Guided by the word FRONT on the gasket, install the gasket over the cylinder head dowels.

4. Place the cylinder head on the engine.

5. Install the cylinder head bolts. The cylinder head bolts are tightened in three progressive steps.

On the 390 V-8, torque all the bolts in sequence (Fig. 33) to 70 ft. lbs. Then torque them to 80 ft-lbs- and finally to specifications. When cylinder head bolts have been tightened following this procedure, it is not necessary to retorque the bolts after extended operation. However, on cylinder heads with composition gaskets, the bolts may be checked and retorqued, if required.

On the 427 V-8 engine, torque all the bolts in sequence (Fig. 33) to 90 ft-lbs. Then torque them to 100 ft-lbs, and finally to specifications.

After the cylinder head bolts have been torqued to specifications, the bolts should not be disturbed.

6. On the left cylinder head, install the ignition coil, engine identification tag and power steering pump (fuel filter on 427 V-8). Adjust the power steering pump belt tension to specifications.

On a vehicle with an air conditioner, install the compressor mounting bracket with the power steering pump. Adjust the compressor drive belt tension to specifications.

7. On the 390 V-8, position new gasket(s) on the muffler inlet pipe(s). Position the exhaust control valve plus the gasket required above it; then connect the exhaust manifold(s) to the muffler inlet pipe(s). On a 390-2V engine, a spacer is used in place of the exhaust control valve. Torque the nuts to specifications.

On the 427 V-8, use new gasket(s) and position the exhaust manifold(s) to the cylinder head(s). Install and torque the retaining bolts to specifications.

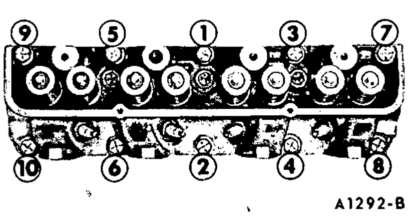

FIG. 33—Cylinder Head Bolt Torque Sequence

If the left cylinder head was removed, install the ignition coil and the fuel filter (427 V-8).

8. Install the baffle plate. Install the intake manifold and related parts following the procedure under Intake Manifold Installation. If equipped with Thermactor exhaust emission control system, connect the hoses.

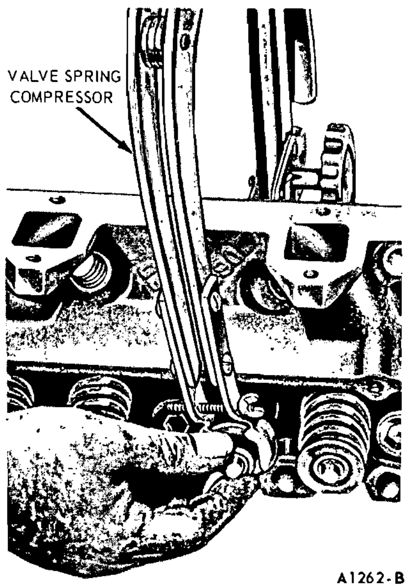

FIG. 34—Compressing Valve Spring—On Bench

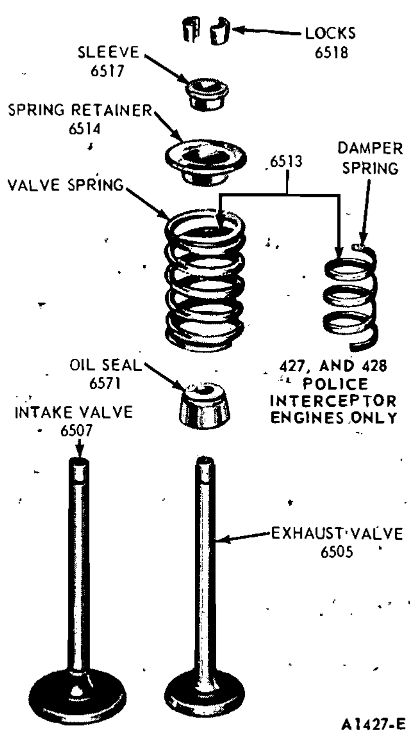

FIG. 35—Typical Valve Assembly

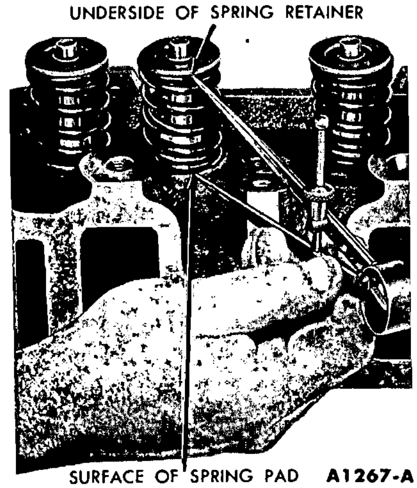

FIG. 36—Valve Spring Assembled Height

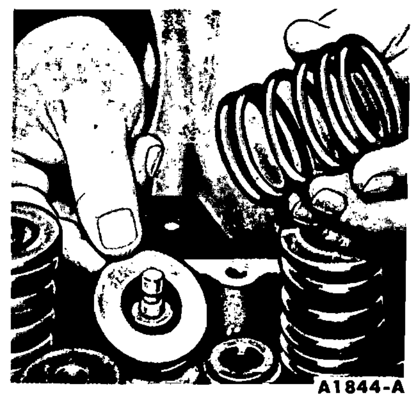

FIG. 37—Valve Spring Spacer Installation

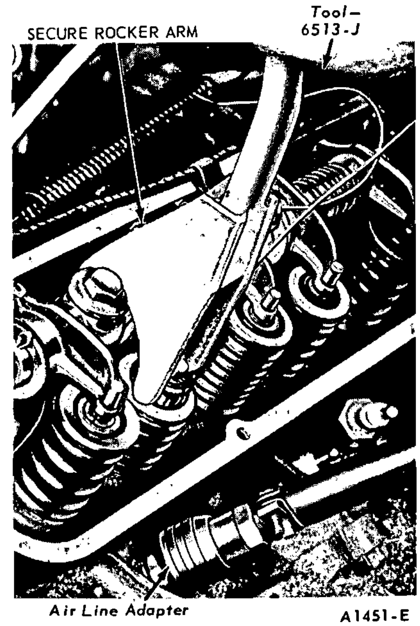

FIG. 38—Compressing Valve Spring— In Chassis

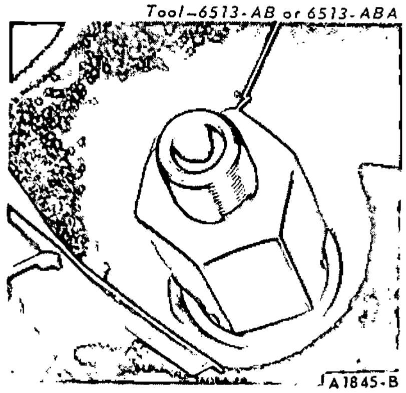

FIG. 39—Installation of Air Adapter Tool in Spark Plug Hole

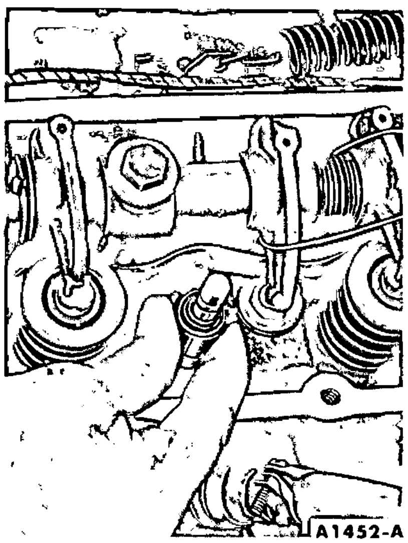

FIG. 40—Valve Stem Seal Removal

DISASSEMBLY

1. Remove the Thermactor exhaust emission control system components. On all engines except the 427 V-8, remove the exhaust manifold(s).

2. Taking special care not to damage the exposed machined surfaces, remove the spark plugs. Clean the carbon out of the cylinder head combustion chambers before removing the valves.

3. Compress the valve springs (Fig. 34). Remove the spring retainer locks and release the spring.

On the 427 V-8, inspect the valve springs before removal to determine if the damper spring(s) is intertwined with the valve spring(s). If this condition exists, replace all defective or worn components (refer to inspection procedures in Part 8-1, Section 3).

4. Remove the sleeve, spring retainer, spring (and damper spring if applicable), stem seal and valve. Discard the valve stem seals. Identify all valve parts.

CLEANING AND INSPECTION

Refer to Part 8-1, Section 3 for the cleaning and inspection procedures.

REPAIRS

Cylinder head repair procedures and checks such as valve and valve seat refacing, cylinder head flatness checks, etc., are covered in Part 8-1, Sections 2 and 3.

ASSEMBLY

1. Install each valve (Fig. 35) in the port from which it was removed or to which it was fitted. Install a new stem seal on the valve. **The exhaust valve stem seal is approximately 0.025 inch shorter in over-all height than the intake valve stem seal (identified with yellow paint); therefore, be sure the seals are installed on the proper valves.**

2. Install the valve spring (closed coils downward) over the valve, and install the spring retainer and sleeve.

On the 427 V-8, make sure the damper spring is installed in the valve spring so that the coil end of the damper spring is 135° counterclockwise from the coil end of the valve spring.

3. Compress the spring and install the retainer locks (Fig. 34).

4. Measure the assembled height of the valve spring from the surface of the cylinder head spring pad to the underside of the spring retainer with dividers (Fig. 36). Check the dividers against a scale. If the assembled height is greater than specified, install the necessary 0.030-inch thick spacer(s) between the cylinder head spring pad and the valve spring (Fig. 37) to bring the assembled height to the recommended specifications.

Do not install spacers unless necessary. Use of spacers in excess of recommendations will result in overstressing the valve springs and overloading the camshaft lobes which could lead to spring breakage and worn camshaft lobes.

5. On the 390 V-8, install the exhaust manifold(s).

6. Install the spark plugs.

Install the Thermactor exhaust emission control components.

VALVE SPRING, RETAINER AND STEM SEAL REPLACEMENT

Broken valve springs, or defective valve stem seals and retainers may be replaced without removing the cylinder head provided damage to the valve or valve seat has not occured.

1. Remove the valve rocker arm cover(s), following step 1, 2 and 3 under Valve Rocker Arm Shaft Assembly Removal.

2. Loosen the valve rocker arm support bolts evenly and alternately, two turns at a time, until the valve spring tension has been released. Remove both of the push rods of the cylinder to be serviced.

3. Tighten the valve rocker arm support bolts evenly and alternately, two turns at a time, until they are snug. Push the rocker arm to one side and secure it in this position (Fig. 38). If an end valve is to be worked on, it will be necessary to remove the rocker arm from the shaft.

4. Remove the applicable spark plug. Install an air adapter in the spark plug hole and connect the air supply hose to the adapter (Fig. 39). Turn on the air supply. **Air pressure may turn the crankshaft until the piston reaches the bottom of its stroke.**

5. Compress the valve spring and remove the valve retainer locks from the valve (Fig. 38). **If air pressure fails to hold the valve in the closed position during this operation, it can be presumed that the valve is not seating or is damaged. If this condition occurs, remove the cylinder head for further inspection.**

6. Remove the valve spring and related parts. Remove the valve stem seal (Fig. 40). **If air pressure has forced the piston to the bottom of the cylinder, any removal of air pressure will allow the valve(s) to fall into the cylinder. A rubber band, tape or string wrapped around the end of the valve stem will prevent this condition and will still allow enough travel to check the valve for binds.**

7. Inspect the valve stem for damage. Rotate the valve and check the valve stem tip for eccentric movement during rotation. Move the valve up and down through normal travel in the valve guide and check the stem for binds. **If the valve has been damaged, it will be necessary to remove the cylinder head for repairs as outlined in Part 8-1, Section 2.**

8. If the condition of the valve proved satisfactory, hold the valve in the closed position and apply the air pressure within the cylinder.

9. Inspect the valve stem seal for a cracked, torn or brittle condition, and replace it if necessary. Install the seal on the valve stem. **The**

exhaust valve stem seal (identified by yellow paint) is approximately 0.025 inch shorter in overall height than the intake valve stem seal; therefore, be sure the proper seal is installed.

10. Install the valve springs, retainer and sleeve over the valve stem. **On 427 V-8 engines only, make sure the valve damper spring is installed in the valve spring so that the coil end of the damper spring is 135° counterclockwise from the coil end of the valve spring.**

11. Compress the valve spring (Fig. 38) and install the valve retainer locks. Tap the valve stem tip with a soft mallet to make certain that the retainer locks are properly seated.

12. Remove the air line and adapter. Install the spark plug. Remove the wire securing the valve rocker arm and slide the rocker arm in position. Install the end rocker arm(s), if they were removed.

13. Loosen the valve rocker arm support bolts evenly and alternately, two turns at a time, until spring tension is removed. Apply Lubriplate to both ends of the push rod. Position the push rod within the rocker arm socket and the valve lifter seat.

14. Tighten the rocker arm shaft support bolts evenly and alternately, two turns at a time, until they are snug. Torque the bolts to specifications.

15. Install the spark plug wires. On engines with hydraulic valve lifters, check the valve clearances and correct if necessary (Part 8-1, Section 2).

16. On engines with mechanical valve tappets, temporarily lay the valve rocker arm covers in place and temporarily connect the spark plug wires. Operate the engine until engine temperatures have stabilized. Remove the valve rocker arm covers and perform a hot valve lash adjustment with the engine idling (Part 8-1, Section 2).

17. Clean the valve rocker arm cover(s). Apply oil-resistant sealer to one side of new cover gasket(s). Lay the cemented side of the gasket(s) in place on the cover(s).

Position the cover(s) on the cylinder head(s). Make sure the gasket seats evenly all around the head. Install the bolts (and the wire loom clamps on the left cover). The cover is tightened in two steps. Torque the bolts to specifications. Two minutes later, torque the bolts to the same specifications. If equipped with a Thermactor exhaust emission control system, connect the air hoses.

18. Connect the automatic choke heat chamber air inlet tube (except 427 V-8). Install the air cleaner.

WATER PUMP

REMOVAL

1. Drain the cooling system.

On a vehicle with power steering, remove the power steering drive belt. Remove the bolts and nuts retaining the power steering pump mounting bracket. Remove the power steering pump and mounting bracket as an assembly, and set to one side.

On a vehicle with an air conditioner, remove the compressor drive belt.

2. Disconnect the radiator lower hose and heater hose at the water pump. Remove the radiator upper support and fan guard. Remove the fan belt(s), fan, fan spacer or fan drive clutch and pulley.

3. Remove the four bolts retaining the pump to the block. Remove the pump and gaskets.

INSTALLATION

Before a water pump is re-installed, check it for damage. If it is damaged and requires repair, replace it with a new pump or install a rebuilt pump obtained from a Ford-Authorized Reconditioner.

1. If a new water pump is to be installed, remove the heater hose fitting from the old pump and install it on the new pump. Remove all gasket material from the mounting surfaces of the cylinder front cover or block and water pump.

2. Position new gasket, coated on both sides with sealer, on the cylinder block; then install the pump.

3. Install the retaining bolts and torque them to specifications.

On a vehicle with power steering, install the power steering pump and bracket assembly, and adjust the power steering drive belt.

On a vehicle with an air conditioner, install and adjust the compressor drive belt.

4. Install the pulley, spacer or fan drive clutch and fan. Torque the capscrews evenly and alternately to specification. Then, check the fan drive clutch flange-to-water pump hub for proper mating. Install the belt(s) and adjust the belt tension. Connect the radiator hose and heater hose. Install the radiator upper support and fan fan guard.

5. Fill and bleed the cooling system. Operate the engine until normal operating temperatures have been reached and check for leaks.

CYLINDER FRONT COVER AND TIMING CHAIN

If the cylinder front cover is being removed to replace the gasket or to replace the fuel pump drive eccentric, it is not necessary to check the timing chain deflection. For cylinder front cover gasket replacement, it is not necessary to remove the timing chain and sprockets.

REMOVAL

1. Drain the cooling system and the crankcase. Disconnect the battery ground cable.

2. Disconnect the radiator upper hose at the thermostat housing (or radiator supply tank). Disconnect the radiator lower hose at the water pump. On a car with automatic transmission, disconnect the transmission oil cooler lines from the radiator.

3. Remove the radiator.

4. Disconnect the heater hose at the water pump and remove the hose from the choke housing clamp. Slide the water pump bypass hose clamp toward the engine.

On a vehicle with power steering, remove the power steering pump bracket mounting bolts. Wire the pump assembly to the left side of the car in a position that will prevent the oil from draining out.

On a vehicle with an air conditioner, remove the compressor mounting bracket bolts, and position the compressor out of the way. **Do not disconnect the compressor refrigerant lines.**

5. Loosen the alternator mounting bolts at the alternator. Remove the drive belt. Remove the alternator support bracket bolts at the water pump and remove the brackets out of the way. Remove the water pump and fan assembly.

On a vehicle with air conditioning remove the condenser retaining bolts and position the condenser forward. **Do not disconnect the refrigerant lines.** Remove the compressor drive belt. On a vehicle equipped with Thermactor exhaust emission control system remove the air supply pump drive belt. If so equipped, remove the accessory drive pulley.

6. Remove the cap screw and washer from the end of the crankshaft. On a vehicle with power steering, remove the power steering pulley from the crankshaft damper. Install the puller on the crankshaft damper (Fig. 41) and remove the damper.

7. Disconnect the carburetor fuel inlet line at the fuel pump.

8. Remove the fuel pump retaining bolts and lay the pump to one side with the flexible fuel line still attached.

9. Remove the crankshaft sleeve as shown in Fig. 42.

10. Remove the screws fastening the cylinder front cover to the block and to the oil pan. Remove the cylinder front cover.

11. Discard the cylinder front cover gasket. Remove the crankshaft front oil slinger.

12. Check the timing chain deflection by following the procedure in Part 8-1, Section 1.

13. Crank the engine until the timing marks on the sprockets are positioned as shown in Fig. 43.

14. Remove the camshaft sprocket cap screw and the fuel pump eccentric.

15. Slide both sprockets and the timing chain forward, and remove them as an assembly (Fig. 44).

16. Remove the oil pan and oil pump screen, following the procedure under Oil Pan Removal.

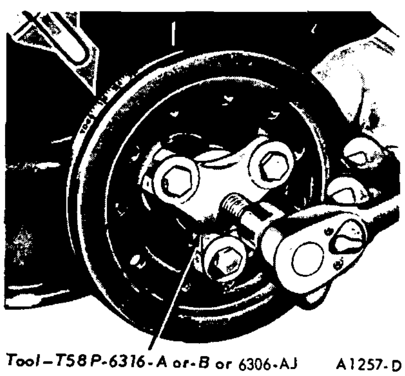

FIG. 41—Crankshaft Damper Removal

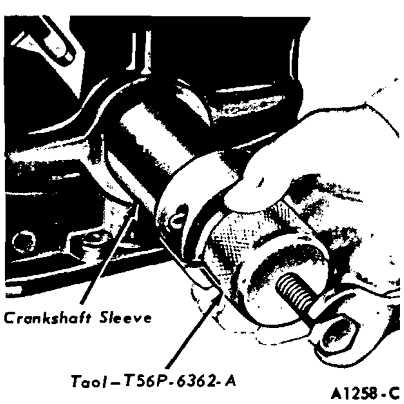

FIG. 42—Crankshaft Sleeve Removal

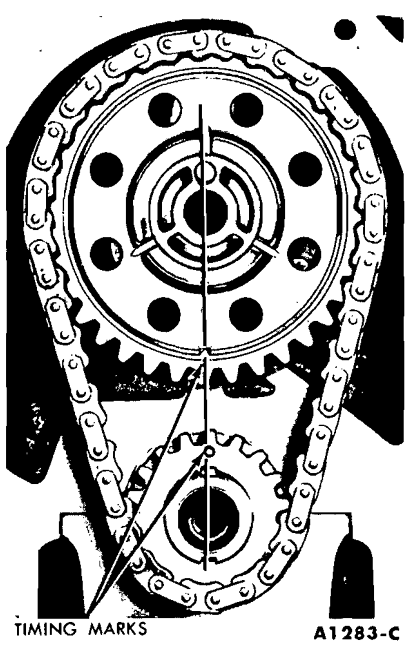

FIG. 43—Aligning Timing Marks

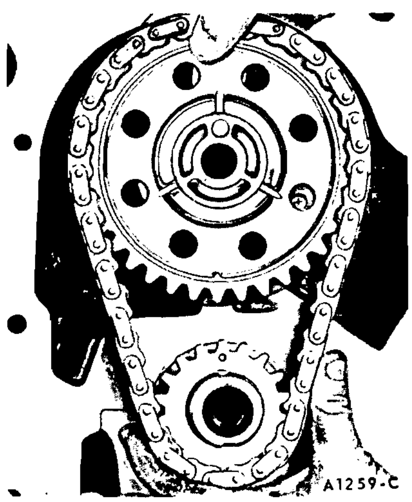

FIG. 44—Timing Chain and Sprocket Removal and Installation

FRONT OIL SEAL REPLACEMENT

It is good practice to replace the oil seal each time the cylinder front cover is removed.

1. Drive out the old seal with a pin punch. Clean out the recess in the cover.

2. Coat a new seal with grease, and install the seal (Fig. 45). Drive the seal in until it is fully seated in the recess. Check the seal after installation to be sure the spring is properly positioned in the seal.

CLEANING AND INSPECTION

Refer to Part 8-1, Section 3 for

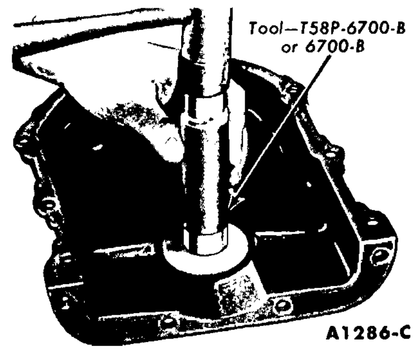

FIG. 45—Oil Seal Installation

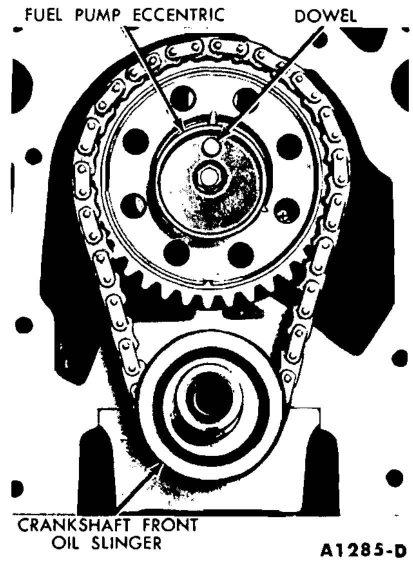

FIG. 46—Fuel Pump Eccentric and Front Oil Slinger Installed

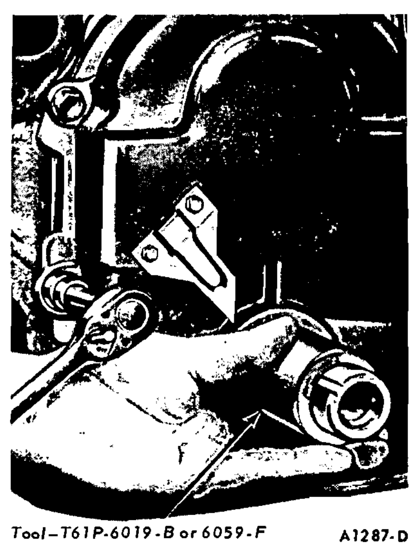

FIG. 47—Cylinder Front Cover Alignment

the cleaning and inspection procedures. Clean the crankshaft damper, following the referenced procedures.

INSTALLATION

1. Position the sprockets and timing chain on the camshaft and crankshaft (Fig. 44). Be sure the timing marks on the sprockets are positioned as shown in Fig. 43).

2. Install the fuel pump eccentric and the camshaft sprocket cap screw (Fig. 46). Torque the sprocket cap screw to specifications. Install the crankshaft front oil slinger.

3. Clean the cylinder front cover, oil pan, and the cylinder block gasket surfaces.

4. Coat the gasket surface of the block and cover and the cover bolt threads with sealer. Position a new gasket on the block.

5. Lubricate and install the alignment pilot tool on the cylinder front cover so that the keyway in the pilot aligns with the key in the crankshaft. Position the cover and pilot over the end of the crankshaft and against the block (Fig. 47). Install the retaining screws.

While pushing in on the pilot, torque the screws to specifications. Remove the pilot.

6. Lubricate the front seal contact surface of the sleeve with lubriplate and install the crankshaft sleeve.

7. Lubricate the inside diameter of the hub and line up the damper keyway with the key on the crankshaft. Install the damper on the crankshaft (Fig. 48).

8. On a vehicle with power steering, install the power steering pump pulley on the damper. Torque the screws to specifications. Install the damper cap screw and washer. Torque the screw to specifications.

9. Clean the oil pan and the oil pump screen. Install the oil pump screen and oil pan, following the procedure under Oil Pan and Oil Pump Installation.

10. Clean the water pump gasket surfaces. Coat new gaskets with sealer and position the gaskets on the block. Install the water pump and fan, and torque the water pump mounting bolts to specifications. Attach the alternator adjusting arm and mounting bracket to the water pump.

11. Install and adjust the alternator drive belt(s) to the specified tension.

12. Install the fuel pump, using a new gasket. Connect the carburetor fuel inlet line, at the fuel pump and at the carburetor filter. Use a new clamp.

13. On a vehicle with an air conditioner, install the compressor and adjust the drive belt.

On a vehicle with power steering, install the power steering pump and drive belt. Adjust the drive belt tension to specifications.

14. Connect the heater hoses. Slide the water pump bypass tube clamp forward on the tube.

15. Install the radiator. Connect the radiator lower hose at the water pump and the radiator upper hose at the thermostat housing (or radiator supply tank). Connect the battery ground cable.

On a vehicle with an automatic transmission, connect the transmission oil cooler lines.

16. Fill and bleed the cooling system. Fill the crankcase with the proper grade and quantity of engine oil. Connect the heater hose to the intake manifold.

17. Operate the engine at fast idle and check for coolant and oil leaks. Adjust the ignition timing.

CAMSHAFT

The camshaft and related parts are shown in Fig. 49).

REMOVAL

1. Remove the cylinder front cover and the timing chain and sprockets following steps 1 thru 11 under Cylinder Front Cover and Timing Chain Removal. If equipped with a Thermactor exhaust emission control system, disconnect the air hoses as necessary for accessibility, and position them out of the way.

2. Remove the grille. On a vehicle with air conditioning, remove the condenser retaining bolts, and position the condenser to one side. **Do not disconnect the condenser refrigerant lines.**

3. Refer to Valve Rocker Arm Shaft Assembly Removal and remove the valve rocker arm covers and the valve rocker arm shaft assemblies.

4. Remove the intake manifold and baffle plate, following the procedures under Intake Manifold Removal.

5. Remove the valve lifters in sequence and place them in a rack so they can be installed in their original locations.

6. Remove the oil pan and oil pump screen by following the procedure under Oil Pan and Oil Pump Removal.

7. Remove the timing chain and sprockets following steps 12 thru 17 under Cylinder Front Cover and Timing Chain Removal.

8. Remove the camshaft thrust plate and spacer. Carefully remove the camshaft by pulling it toward the front of the engine. **Use caution to avoid damaging the camshaft bearings.**

CLEANING AND INSPECTION

Refer to Part 8-1, Section 3 for the cleaning and inspection procedures.

REPAIRS

Refer to Part 8-1, Section 2 for the repair procedures.

INSTALLATION—ENGINES WITH HYDRAULIC VALVE LIFTERS

1. Oil the camshaft journals and apply Lubriplate to the lobes. Carefully slide the camshaft through the bearings. Install the thrust plate and spacer. **The chamfered ID of the spacer must be toward the camshaft front journal. Be sure the thrust plate oil groove is up and towards the front (next to camshaft sprocket).**

2. Check the camshaft end play. Install a dial indicator so the indicator point is on the camshaft sprocket retaining screw. Push the camshaft toward the rear of the engine and set the dial indicator on zero. Pull the camshaft forward and release it. Compare the indicator reading with the specifications. If the end play is excessive, check the spacer for correct installation. If the spacer is installed correctly, replace the thrust plate.

3. Position the sprockets and timing chain on the camshaft and crankshaft (Fig. 44) with the timing marks on the sprockets aligned as shown in in Fig. 43.

4. Install the fuel pump eccentric and the camshaft sprocket cap screw (Fig. 46). Torque the sprocket cap screw to specifications. Install the front oil slinger.

5. Replace the crankshaft front oil seal. Install the cylinder front cover, crankshaft damper, and related parts following steps 3 thru 15 under Cylinder Front Cover and Timing Chain Installation.

6. Install the grille.

7. Install the valve lifters in the bores, from which they were removed. Install the intake manifold, following the procedures under Engines With Hydraulic Valve Lifters.

8. Install the push rods in their original positions. Refer to Valve Rocker Arm Shaft Assembly In-

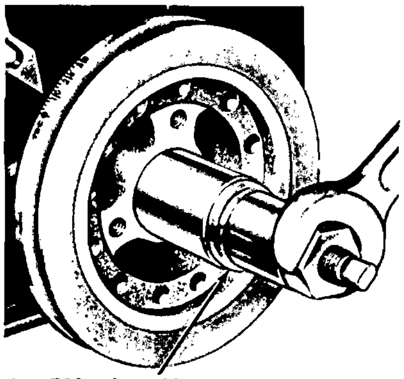

FIG. 48—Crankshaft Damper Installation

stallation and install the valve rocker arm shaft assembly following steps 1 thru 9.

If equipped with a Thermactor exhaust emission control system, connect the air hoses.

On a vehicle with air conditioning, position the condenser and install the retaining bolts. Install the radiator.

9. Fill and bleed the cooling system. Fill the crankcase with the proper grade and quantity of engine oil.

10. Start the engine and check and adjust the ignition timing. Connect the distributor vacuum line (390 V-8). Operate the engine at fast idle and check all hose connections and gaskets for leaks.

INSTALLATION—ENGINES WITH MECHANICAL VALVE TAPPETS

1. Follow steps 1 thru 4 under Installation—Engines With Hydraulic Valve Lifters.

2. Replace the crankshaft front oil seal. Install the cylinder front cover, crankshaft damper and related parts following steps 3 thru 15 under Cylinder Front Cover and Timing Chain Installation.

3. Install the grille.

4. Install the tappets in the bores from which they were removed. Install the intake manifold, following steps 1 thru 10 under Engines With Hydraulic Valve Lifters.

5. Install the push rods in their original positions. Refer to Valve Rocker Arm Shaft Assembly Installation and install the valve rocker arm shaft assembly following steps 1 thru 6.

6. Temporarily install the valve rocker arm covers and connect the spark plug wires.

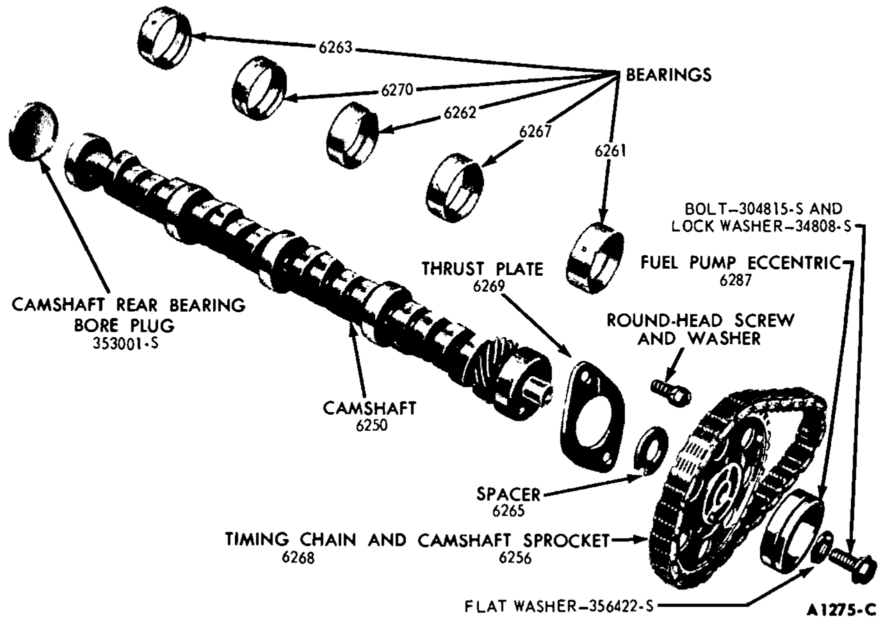

FIG. 49—Camshaft and Related Parts

7. Fill and bleed the cooling system. Fill the crankcase with the proper grade and quantity of engine oil.

8. Start the engine and check and adjust the ignition timing. Connect the distributor vacuum line (390 V-8). Operate the engine at fast idle and check all hose connections and gaskets for leaks. Operate the engine for 30 minutes at 1200 rpm to stabilize engine temperatures. Remove the valve rocker arm covers and perform a hot valve lash adjustment with the engine idling (Part 8-1, Section 2).

9. Clean the valve rocker arm cover(s). Apply oil-resistant sealer to one side of new cover gasket(s). Lay the cemented side of the gasket(s) in place in the cover(s).

10. Position the cover(s) on the cylinder head(s). Make sure the gasket seats evenly all around the head. Install the bolts (and the wire loom clamps on the left cover). The cover is tightened in two steps. Torque the bolts to specifications. Two minutes later, torque the bolts to the same specifications.

11. Connect the brake booster vacuum line. Install the carburetor choke heat tube.

12. Connect the spark plug wires.

CAMSHAFT REAR BEARING BORE PLUG REPLACEMENT

1. On a vehicle with a manual-shift transmission, slide the transmission to the rear and remove the clutch pressure plate, disc and flywheel housing following the procedure in Group 5.

On a vehicle with an automatic transmission, remove the transmission and converter housing following the procedure in Group 7.

2. Remove the flywheel retaining bolts and remove the flywheel. Remove the rear cover plate.

3. Drill a 1/2-inch hole in the camshaft rear bearing bore plug and use tool T-7600-E to remove the plug.

4. Clean out the plug bore recess thoroughly.

5. Coat the flange of a new plug with oil-resistant sealer and install it with the flange facing inward (Fig. 50).

6. Install the rear cover plate. Install the flywheel.

On a vehicle with a manual-shift transmission, install the clutch pressure plate, disc and flywheel housing and install the transmission following the procedure in Group 5.

On a vehicle with an automatic transmission, install the transmission and converter housing following the procedure in Group 7.

VALVE LIFTER OR TAPPET REPLACEMENT

The following procedure is applicable for removing one or all of the valve lifters and it applies to either hydraulic valve lifters or solid valve tappets.

1. Remove the intake manifold, following the procedures under Intake Manifold Removal.

2. Remove the valve lifters or tappets with a magnet. Place the lifters in a rack so that they can be installed in their original positions.

On an engine with hydraulic valve

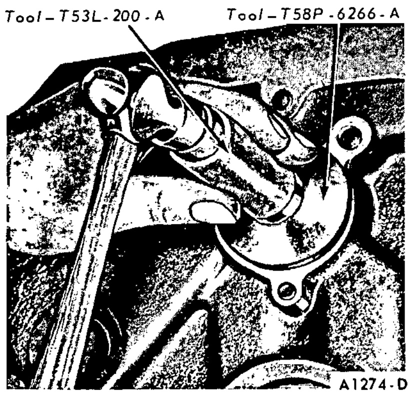

FIG. 50—Camshaft Rear Bearing Bore Plug Installation

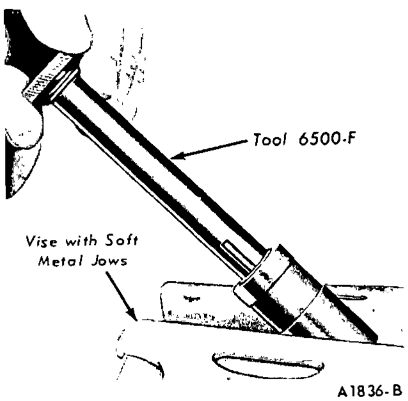

FIG. 51—Lifter Plunger Removal

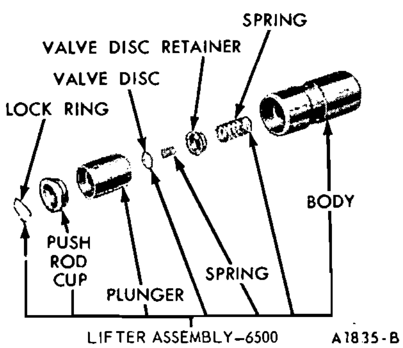

FIG. 52—Typical Hydraulic Valve Lifter Assembly

lifters, the internal parts of each hydraulic valve lifter assembly are matched sets. Do not inter-mix the parts. Keep the assemblies intact until they are to be cleaned.

3. Install the new (or cleaned) hydraulic valve lifters or tappets with a magnet.

4. Install the intake manifold, following the procedures under Intake Manifold Installations for hydraulic valve lifters or mechanical valve tappets.

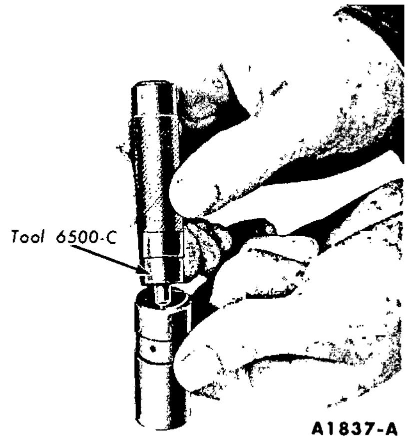

FIG. 53—Valve Lifter Lock Ring Installation

HYDRAULIC VALVE LIFTER DISASSEMBLY

Each valve lifter is a matched assembly. If the parts of one lifter are intermixed with those of another, improper valve operation may result. Disassemble and assemble each lifter separately. Keep the lifter assemblies in proper sequence so that they can be installed in their original bores.

1. Grasp the lock ring with the needle nose pliers to release it from the groove. It may be necessary to depress the plunger to fully release the lock ring.

2. Remove the push rod cup. Remove the plunger (Fig. 51) and plunger spring.

3. Invert the plunger assembly and remove the disc valve retainer by carefully prying up on it with a screw driver. Remove the disc valve and spring.

CLEANING AND INSPECTION

Refer to Part 8-1, Section 3 for the cleaning and inspection procedures.

HYDRAULIC VALVE LIFTER ASSEMBLY

A typical hydraulic valve lifter assembly is shown in Fig. 52.

1. Place the plunger upside down on a clean work bench.

2. Place the disc valve in position over the oil hole on the bottom of the plunger. Set the disc valve spring on top of the disc.

3. Position the disc valve retainer over the disc and spring and push the retainer down into place on the plunger.

4. Place the plunger spring and then the plunger (open end up) into the lifter body.

5. Place the push rod cup in the plunger.

6. Push the plunger and push rod cup into the body and install the lock ring (Fig. 53). Release the plunger; then depress it again to fully seat the lock ring.

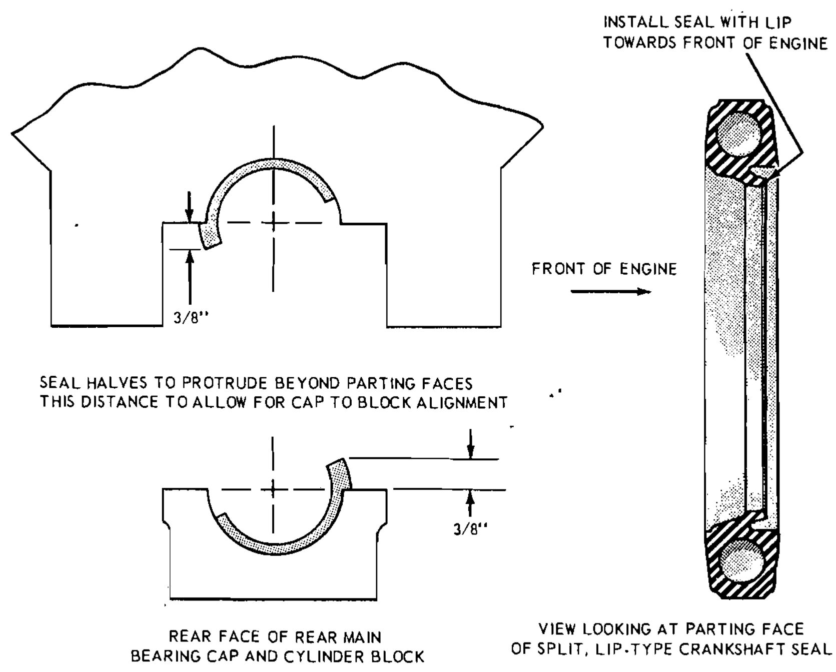

FIG. 54—Crankshaft Rear Seal Installation

7. Use the hydraulic valve lifter leakdown tester (Part 8-1) to fill the lifters with test fluid.

TESTING

Refer to Part 8-1, Section 1 for the test procedure.

CRANKSHAFT REAR OIL SEAL REPLACEMENT

Replacement of a crankshaft rear oil seal to correct for oil leaks requires replacement of both the upper and lower seals, as follows:

1. Remove the oil pan and oil pump (as required) following the procedures in this section.

2. Loosen all the main bearing cap bolts, thereby lowering the crankshaft slightly but not to exceed 1/32 inch.

3. Remove the rear main bearing cap, and remove the oil seal from the bearing cap and cylinder block. On the block half of the seal, install a small metal screw in one end of the seal and pull on the screw to remove the seal.

4. Carefully clean the seal grooves in the cap and block with a brush and solvent.

5. Dip the seal halves in clean engine oil.

6. Carefully install the upper seal (cylinder block) into its groove with undercut side of seal toward the FRONT of the engine (Fig. 54), by rotating it on the seal journal of the crankshaft until approximately 0.375 inch protrudes below the parting surface.

Be sure no rubber has been shaved from the outside diameter of the seal by the bottom edge of the groove.

7. Tighten the remaining bearing cap bolts and torque to specifications.

8. Install the lower seal in the rear main bearing cap with undercut side of seal toward the FRONT of the engine (Fig. 54), allow the seal to protrude approximately 0.375 inch above the parting surface to mate with the upper seal when the cap is installed.

9. Apply a thin coating of oil-resistant sealer to the rear main bearing cap at the rear of the top mating surface. **Do not apply sealer to the area forward of the side seal groove.** Install the rear main bearing cap. Torque the cap bolts to specifications.

10. Dip the side seals in light engine oil; then immediately install them in the grooves. Do not use sealer on the side seals. **The seals are designed to expand when dipped in oil. Using sealer may retard this expansion.** It may be necessary to tap the seals into place for the last 1/2 inch of travel. Do not cut the seal projecting ends.

11. Check the retainer side seals for leaks by squirting a few drops of oil into the parting lines between the rear main bearing cap and the cylinder block from the outside. Blow compressed air against the seals from the inside of the block. If air bubbles appear in the oil, it indicates possible oil leakage. **This test should not be performed on newly installed seals until sufficient time has been allowed for the seals to expand into the seal grooves.**

12. Install the oil pump and oil pan. Install the oil level dipstick. Fill the crankcase with the proper amount and viscosity oil. Install the spark plugs.

13. Operate the engine and check for oil leaks.

MAIN AND CONNECTING ROD BEARING REPLACEMENT

The main and connecting rod bearing inserts are selective fit. **Do not file or lap bearing caps or use shims to obtain the proper bearing clearance.**

Selective fit bearings are available for service in standard sizes and 0.002 inch undersize. Standard bearings are divided into two sizes and are identified by a daub of red or blue paint. Refer to the Parts Catalog for the available sizes. **Red marked bearings increase the clearance; blue marked bearings decrease the clearance.** Undersize bearings, which are not selective fit, are available for use on journals that have been refinished.

MAIN BEARING REPLACEMENT

1. Drain the crankcase. Remove the oil level dipstick. Remove the oil pan and oil pump. Remove the spark plugs to allow easy rotation of the crankshaft.

2. Replace one bearing at a time leaving the other bearing securely fastened. Remove the main bearing cap to which new bearings are to be installed.

On a 427 V-8, remove the main bearing cap cross-bolts, washers and spacers (Fig. 55) before removing the cap retaining bolts.

3. Insert the upper bearing removal tool (tool 6331-E) in the oil hole in the crankshaft (Fig. 56).

4. Rotate the crankshaft in the direction of engine rotation to force the bearing out of the block.

5. Clean the crankshaft journal and bearing inserts. **When replacing standard bearings with new bearings, it is good practice to first try to obtain the proper clearances with two blue bearing halves.**

6. To install the upper main bearing, place the plain end of the bearing over the shaft on the locking tang side of the block and partially install the bearing so that tool 6331-E can be inserted in the oil hole in the crankshaft (Fig. 56). With tool 6331-E positioned in the oil hole in the crankshaft, rotate the crankshaft in the opposite direction of engine rotation until the bearing seats itself. Remove the tool.

7. Install the cap bearing.

8. Support the crankshaft so that its weight will not compress the Plastigage and provide an erroneous reading. Position a small jack so that it will bear against the counterweight adjoining the bearing which is being checked.

9. Place a piece of Plastigage on the bearing surface the full width of the bearing cap and about 1/4 inch off-center (Fig. 57).

10. Install the cap and torque the bolts to specifications. **Do not turn the crankshaft while the Plastigage is in place. When checking the width of the Plastigage, check at the widest point in order to get the minimum clearance. Check at the narrowest point in order to get the maximum clearance. The difference between the two readings is the journal taper.**

11. If the clearance is less than the specified limits, try two red bearing halves or a combination of red and blue depending upon the condition. If the clearance exceeds specified limits, try 0.002 inch undersize bearings in combination with blue or red bearings. **The bearing clearance must be within specified limits. Whenever a combination of 0.002 inch undersize bearings with blue or red bearings is used, the 0.002 inch undersize bearing should go in the top, or block.** If the standard and 0.002 inch undersize bearings do not bring the clearance within the desired limits, refinish the crankshaft journal. Then install undersize bearings. **Do not** file or lap bearing caps or use shims in an effort to decrease bearing clearances.

12. After the bearing has been checked and found to be satisfactory, apply a light coat of engine oil to the journal and bearings; then install the bearing cap. Torque the cap bolts to specifications.

13. If the thrust bearing cap (No. 3 main bearing) has been removed, install it as follows:

Install the thrust bearing cap with the bolts finger-tight. Pry the crank-

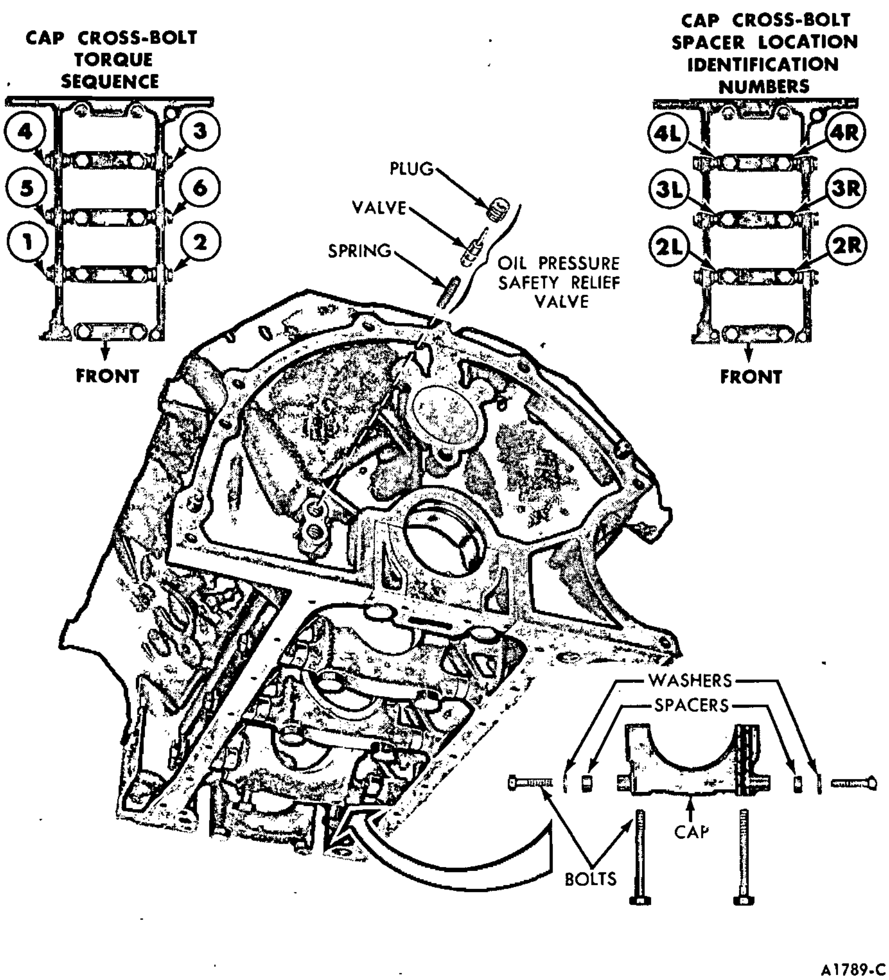

FIG. 55—427 V-8 Cylinder Block Details

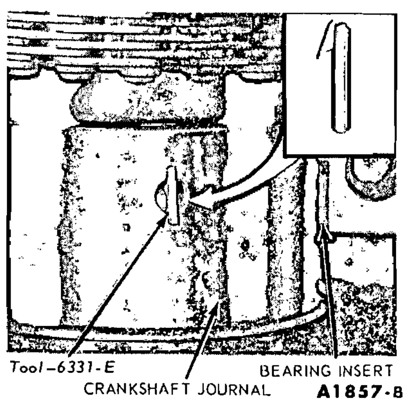

FIG. 56—Upper Main Bearing Insert Removal or Installation

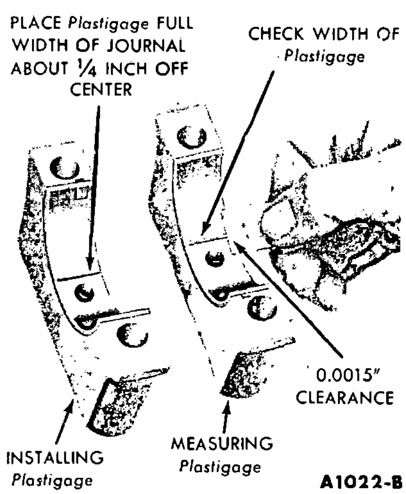

FIG. 57—Installing and Measuring Plastigage—Engine in Chassis

shaft forward against the thrust surface of the upper half of the bearing (Fig. 73). Hold the crankshaft forward and pry the thrust bearing cap to the rear (Fig. 73). This will align the thrust surfaces of both halves of the bearing. Retain the forward pressure on the crankshaft. Torque the cap bolts to specifications.

14. On a 427 V-8, after all the main bearings have been fitted, torque all the main bearing cap bolts to specifications.

Make sure the cross-bolt spacers are installed in their proper locations (Fig. 55). Production spacers are marked L-2, R-2, L-3, R-3, L-4 and R-4.

Install and torque the cross-bolts in two steps, following the sequence shown in Fig. 55. First, torque all the cross-bolts to 20 ft-lbs. Finally, torque all the cross-bolts to specifications.

15. Repeat the procedure for the remaining bearings that require replacement.

16. If the rear main bearing is to be replaced, remove the rear main bearing cap. Remove and discard the rear seal and side seals.

17. Clean the rear journal oil seal groove in the block and cap.

18. Install a new rear oil seal in the rear main bearing cap and block, following the procedures under Crankshaft Rear Oil Seal Replacement.

19. Apply a thin coating of oil resistant sealer to the rear main bearing cap at the rear of the top mating surface. **Do not apply sealer to the area forward of the side seal groove.** Install the rear main bearing cap. Torque the cap bolts to specifications.

20. Dip the side seals in light engine oil; then immediately install them in the grooves. **Do not use sealer on the side seals. The seals are designed to expand when dipped in oil. Using sealer may retard this expansion.** It may be necessary to tap the seals into place for the last 1/2 inch of travel. Do not cut the seal projecting ends.

21. Check the retainer side seals for leaks by squirting a few drops of oil into the parting lines between the rear main bearing cap and the cylinder block from the outside. Blow compressed air against the seals from the inside of the block. If air bubbles appear in the oil, it indicates possible oil leakage. **This test should not be performed on newly installed seals until sufficient time has been allowed for the seals to expand into the seal grooves.**

22. Disassemble, clean and assemble the oil pump if necessary. Prime the oil pump by filling the inlet opening with oil and rotate the pump shaft until oil emerges from the outlet opening. Install the oil pump and oil pan.

23. Install the oil level dipstick. Fill the crankcase with the proper amount and viscosity oil. Install the spark plugs.

24. Operate the engine and check for oil leaks.

CONNECTING ROD BEARING REPLACEMENT

1. Follow step 1 under Main Bearing Replacement.

2. Turn the crankshaft until the connecting rod to which new bearings are to be fitted is down.

3. Remove the connecting rod cap. Push the connecting rod up into the cylinder and remove the bearing insert from the rod and cap.

4. Follow step 5 under Main Bearing Replacement.

5. Install the new bearings in the connecting rod and cap. Pull the connecting rod assembly down firmly on the crankshaft journal.

6. Place a piece of Plastigage on the lower bearing surface, the full width of the cap and about 1/4 inch off-center.

7. Install the cap and torque the connecting rods nuts to specifications. **Do not turn the crankshaft while the Plastigage is in place.**

8. Remove the cap; then, using the Plastigage scale, check the width of the Plastigage. **When checking the width of the Plastigage, check at the widest point in order to get the minimum clearance. Check at the narrowest point in order to get the maximum clearance. The difference between the two readings is the journal taper.**

9. If the clearance is less than the specified limits, try two red bearing halves or a combination of red and blue depending upon the condition.

If the clearance exceeds the specified limits, try 0.002 inch undersize bearings in combination with blue or red bearings. **The bearing clearance must be within-specified limits.**

If the proper clearance cannot be achieved with standard or 0.002 undersize bearings, the crankshaft will have to be ground undersize and fitted with undersize bearings.

10. After the bearing clearance has been checked and found to be satisfactory, apply a light coat of engine oil to the journal and bearings. Install the connecting rod cap.

11. Repeat the procedure for the remaining connecting rods that require new bearings.

12. Follow step 22, 23 and 24 under Main Bearing Replacement.

CLEANING AND INSPECTION

Refer to Part 8-1, Section 3 for the cleaning and inspection procedures.

PISTON AND CONNECTING ROD ASSEMBLY

REMOVAL

1. Drain the cooling system and the crankcase. Remove the intake manifold, cylinder heads, oil pan and oil pump following the procedures in this section.

2. Remove any ridge and/or deposits from the upper end of the cylinder bores as follows:

Turn the crankshaft until the piston to be removed is at the bottom of its travel and place a cloth on the piston head to collect the cuttings. Remove any ridge and/or deposits from the upper end of the cylinder bores. Remove the cylinder ridge with a ridge cutter (tool 6011-E). Follow the instructions furnished by the tool manufacturer. **Never cut into the ring travel area in excess of 1/32 inch when removing ridges.**

3. Make sure all connecting rod caps are marked so that they can be installed in their original locations.

4. Turn the crankshaft until the connecting rod being removed is down.

5. Remove the connecting rod cap.

6. Push the connecting rod and piston assembly out of the top of the cylinder with the handle end of a hammer. **Avoid damage to the crankshaft journal or the cylinder wall when removing the piston and rod.**

7. Remove the bearing inserts from the connecting rod and cap.

8. Install the cap on the connecting rod from which it was removed.

INSTALLATION

1. If new piston rings are to be installed, remove the cylinder wall glaze (Part 8-1, Section 2, Repairs —Cylinder Block). Follow the instructions of the tool manufacturer. After performing cylinder bore repairs, clean the bore(s), following the procedure in Part 8-1, Section 3.

2. Oil the piston rings, pistons and cylinder walls with light engine oil. **Be sure to install the pistons in the same cylinders from which they were removed or to which they were fitted. The connecting rod and bearing cap are numbered from 1 to 4 in the right bank and from 5 to 8 in the left bank, beginning at the front of the engine. The numbers on the connecting rod and bearing cap must be on the same side when installed in the cylinder bore. If a connecting rod is ever transposed from one block or cylinder to another, new bearings should be fitted, and the connecting rod should be numbered to correspond with the new cylinder number.**

3. Make sure the ring gaps are properly spaced around the circumference of the piston (Fig. 58).

4. Install a piston ring compressor on the piston and push the piston in with a hammer handle until it is slightly below the top of the cylinder (Fig. 59). Be sure to guide the connecting rods to avoid damaging the crankshaft journals. **Install the piston with the indentation in the piston head toward the front of the engine.**

5. Check the clearance of each bearing following the procedure under Connecting Rod Bearing Replacement.

6. After the bearings have been fitted, apply a light coat of engine oil to the journals and bearings.

7. Turn the crankshaft throw to the bottom of its stroke. Push the piston all the way down until the connecting rod bearing seats on the crankshaft journal.

8. Install the connecting rod cap. Torque the nuts to specifications.

9. After the piston and connecting rod assemblies have been installed, check the side clearance between the connecting rods on each crankshaft journal (Fig. 60).

10. Disassemble, clean and assemble the oil pump. Clean the oil pump inlet tube screen and the oil pan and block gasket surfaces.

11. Prime the oil pump by filling the inlet opening with oil and rotate the pump shaft until oil emerges from the outlet opening. Install the oil pump and pan.

12. Install the cylinder heads by following steps 1 thru 6 under Cylinder Head Installation.

13. Refer to Intake Manifold Installation and install the intake manifold by following steps 2 thru 18 under Engines with Hydraulic Valve Lifters or steps 1 thru 8 under Engines with Mechanical Tappets.

14. Fill and bleed the cooling system. Fill the crankcase with the proper grade and quantity of engine oil.

15. Install the automatic choke heat chamber air inlet tube (except 427 V-8). Install the air cleaner. Operate the engine and check for oil and coolant leaks. Check and adjust the ignition timing.

On an engine with mechanical lifters, perform a final (hot) valve lash adjustment (Part 8-1, Section 2), and install the valve rocker arm covers.

16. Adjust the engine idle speed and fuel mixture.

DISASSEMBLY

1. Mark the pistons and pins to assure assembly with the same rod and installation in the same cylin-

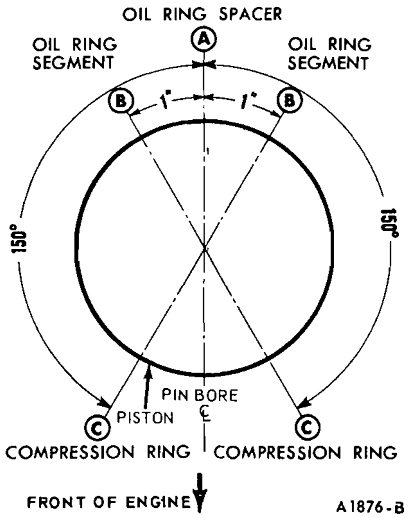

FIG. 58—Piston Ring Gap Spacing

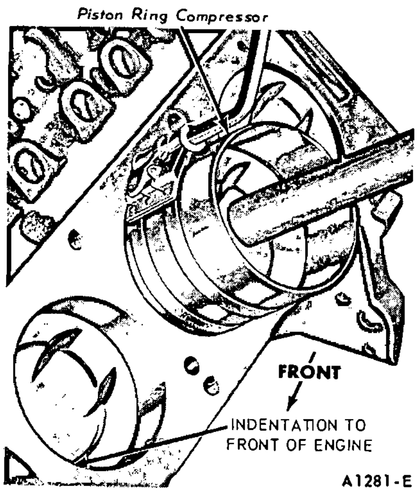

FIG. 59—Typical Piston Installation

der from which they were removed.

2. Remove the piston rings. Remove the piston pin retainers. Drive the pin out of the piston and connecting rod (Fig. 61). Discard the retainers.

CLEANING AND INSPECTION

Refer to Part 8-1, Section 3 for the cleaning and inspection procedures.

REPAIRS

Refer to Part 8-1, Section 2 for the repair procedures.

ASSEMBLY

The piston, connecting rod and related parts are shown in Fig. 62.

1. Lubricate all parts with light engine oil. Position the connecting

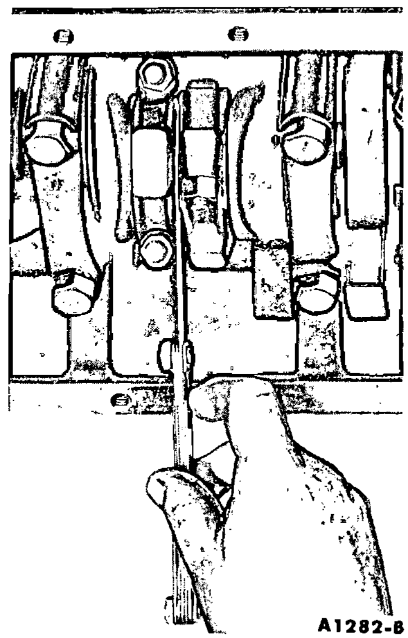

FIG. 60—Connecting Rod Side Clearance

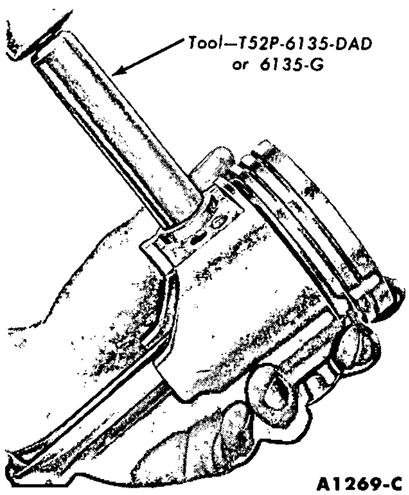

FIG. 61—Piston Pin Removal

rod in the piston and push the pin into place. Assemble the piston and connecting rod as shown in Fig. 63.

2. Insert new piston pin retainers into the piston. Check the end gap of all piston rings (Part 8-1). It must be within specifications (Part 8-4). Follow the instructions contained on the piston ring package and install the piston rings. Be sure the piston ring gaps are properly spaced (Fig. 58).

3. Check the ring side clearance of the compression rings with a feeler gauge (step 6 under Fitting Piston Rings in Part 8-1, Section 2).

4. Be sure the bearing inserts and the bearing bore in the connecting rod and cap are clean. Foreign ma-

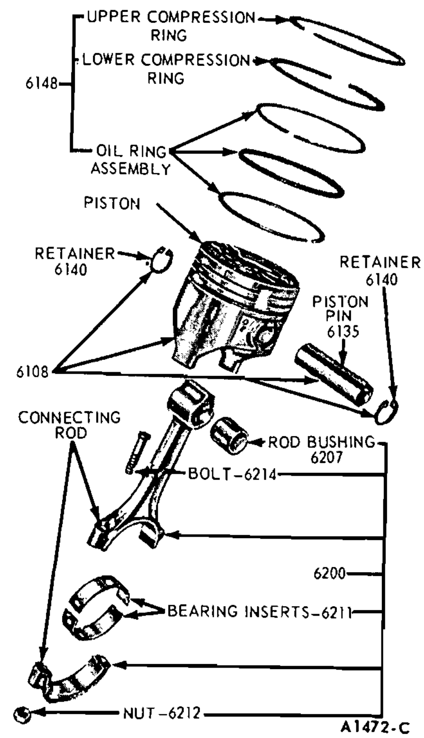

FIG. 62—Typical Piston Connecting Rod and Related Parts

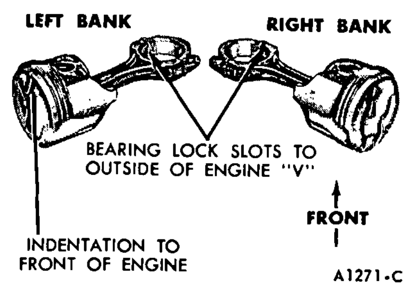

FIG. 63—Correct Piston and Connecting Rod Position

terial under the inserts will distort the bearing and cause a failure. Install the bearing inserts in the connecting rod and cap with the tangs fitting in the slots provided.

FLYWHEEL

REMOVAL

1. Disconnect the transmission from the engine and slide it to the rear as outlined in Group 5 (manual-shift transmission) or on an automatic transmission remove the transmission (Group 7).

On a manual-shift transmission, remove the pressure plate and cover assembly as outlined in Group 5.

2. Remove the flywheel retaining bolts and remove the flywheel.

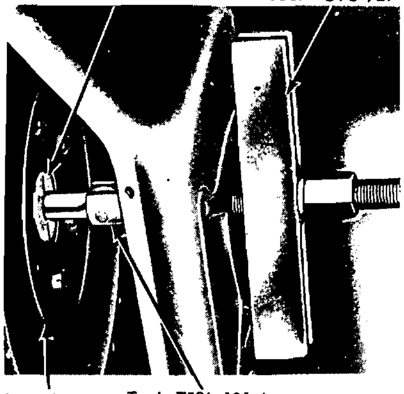

FIG. 64—Typical Clutch Pilot Bushing Removal

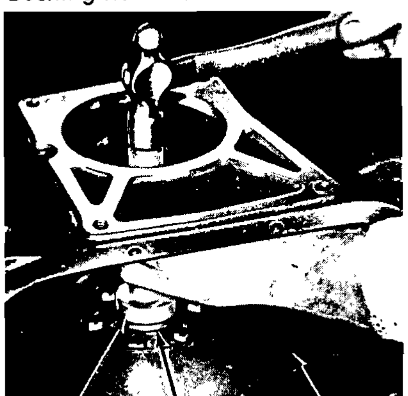

FIG. 65—Typical Clutch Pilot Service Bearing Installation

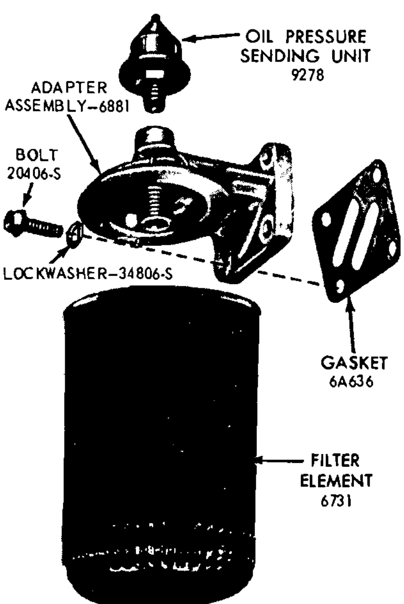

FIG. 66—Typical Oil Filter Assembly

CLEANING AND INSPECTION

Refer to Part 8-1, Section 3 for the cleaning and inspection procedures.

FIG. 67—Oil Filter Replacement

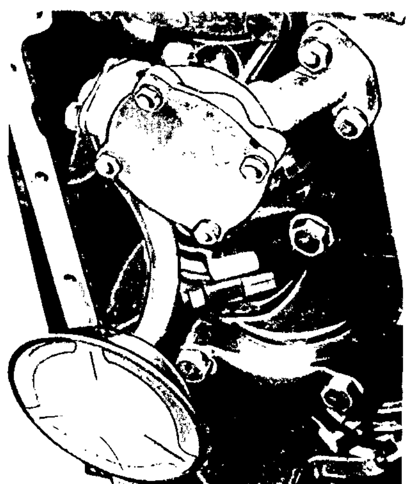

FIG. 68—Typical Oil Pump and Inlet Tube Installation

REPAIRS

To check flywheel face runout or replace flywheel ring gear, refer to Part 8-1, Section 2.

INSTALLATION

1. Install the flywheel on the crankshaft flange and install the retaining bolts. Torque the bolts in sequence across from each other to specifications.

2. Check the flywheel runout, following the procedure in Part 8-1, Section 1.

3. On a manual-shift transmission, install the pressure plate and cover assembly (Group 5).

4. Connect the transmission to the engine as outlined in Group 5 (manual-shift transmissions) or on an automatic transmission, install the transmission (Group 7). It is not necessary to adjust the transmission, when it has been removed only for flywheel removal.

CLUTCH PILOT BUSHING REPLACEMENT

Inspection procedures are outlined under Crankshaft Cleaning and Inspection in Part 8-1, Section 3.

1. Disconnect the transmission from the engine and slide it to the rear as outlined in Group 5.

2. Remove the pressure plate and cover assembly and the clutch disc as outlined in Group 5.

3. Remove the pilot bushing (Fig. 64).

4. Coat the pilot bushing bore in the crankshaft with a small quantity of wheel bearing lubricant. **Avoid using too much lubricant as it may be thrown onto the clutch disc when the clutch revolves.**

5. Install the pilot service bearing (Fig. 65).

6. Install the clutch disc and the pressure plate and cover assembly as outlined in Group 5.

7. Connect the transmission to the engine as outlined in Group 5.

OIL FILTER REPLACEMENT

The oil filter assembly is shown in Fig. 66.

1. Place a drip pan under the filter. Unscrew the filter from the adapter fitting. Clean the adapter filter recess.

2. Coat the gasket on the new filter with oil. Place the filter in position on the adapter (Fig. 67). Hand tighten the filter until the gasket contacts the adapter face. Then advance it 1/2 turn.

3. Operate the engine at fast idle and check for leaks. If oil leaks are evident, perform the necessary repairs to correct the leakage. Check the oil level and fill the crankcase if necessary.

OIL PAN

REMOVAL

1. Raise the vehicle and place safety stands into position. Drain the

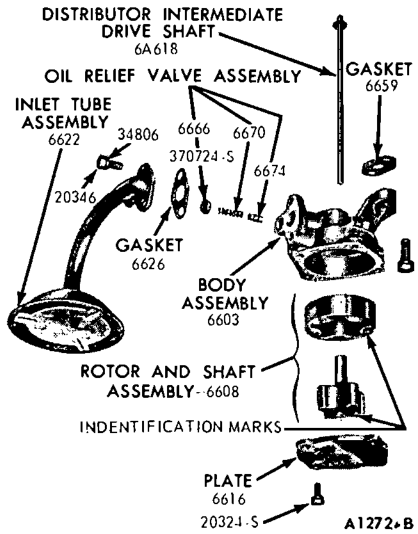

FIG. 69—Typical Oil Pump Assembly

oil from the crankcase. On a vehicle equipped with air conditioning, remove the fan shroud from the radiator and position it over the fan.

2. Disconnect the stabilizer bar at the connecting links and pull the ends down.

3. To allow clearance for removal of the oil pan, remove the engine front support insulator to intermediate support bracket nuts and lock washers. Install a block of wood on a floor jack and position the jack under the front leading edge of the oil pan. Raise the engine approximately 1 1/4 inches and insert a 1 inch block of wood between the insulators and the frame cross member. Remove the floor jack.

4. Remove the oil pan retaining screws and lower the oil pan to the frame cross member.

5. Crank the engine to obtain the necessary clearance between the crankshaft counterweight and the rear of the oil pan. Remove the upper bolt and loosen the lower bolt on the inlet tube (Fig. 68). Position the inlet tube and screen out of the way, and remove the oil pan.

CLEANING AND INSPECTION

Refer to Part 8-1, Section 3 for the cleaning and inspection procedures.

INSTALLATION

1. Clean the oil pan and cylinder block gasket surfaces. Clean the oil pump inlet tube screen. Position a new oil pump inlet tube gasket on the oil pump and install the inlet tube (Fig. 68) with the lower bolt only. Do not tighten the bolt.

2. Apply oil-resistant sealer to the oil pan gasket surfaces and position the gasket on the oil pan.

3. Position the oil pan on the crossmember and install the inlet tube to oil pump upper mounting bolt. Tighten both bolts.

4. Hold the oil pan in place against the cylinder block and install a retaining screw on each side of the pan. Using the special spring washers, install the oil pan to rear main bearing cap bolts. Install the remaining screws and tighten them from the center outward. Torque the screws to specifications.

5. Position the floor jack and block of wood under the leading edge of the oil pan. Raise the engine slightly and remove the wood blocks from beneath the insulators. Lower the engine and remove the jack. Install the insulator to frame lock washers and nuts. Torque the nuts to specifications.

6. Connect the stabilizer bar. **Replace the oil filter.** Remove the safety stands and lower the vehicle. If the fan shroud was removed, install it on the radiator.

7. Fill the crankcase with the proper grade and quantity of engine oil. Operate the engine and check for oil leaks.

OIL PUMP

REMOVAL

1. Remove the oil pan, refer to Oil Pan Removal.

2. Remove the oil pump retaining screws; then remove the oil pump and intermediate drive shaft.

3. Remove the inlet tube and screen assembly from the oil pump. Discard the gasket.

INSTALLATION

1. Prime the oil pump by filling either the inlet or outlet port with engine oil. Rotate the pump shaft to distribute the oil within the pump body.

2. Position a new gasket on the pump housing. Insert the intermediate drive shaft into the oil pump. Install the pump and shaft as an assembly (Fig. 68). **Do not attempt to force the pump into position if it will not seat readily. The drive shaft hex may be misaligned with the distributor shaft. To align, rotate the intermediate shaft into a new position.** Torque the oil pump retaining screws to specifications.

3. Install the inlet tube and screen assembly and oil pan, following the procedure under Oil Pan Installation.

DISASSEMBLY

1. Remove the oil inlet tube from the oil pump and remove the gasket.

2. Remove the cover retaining screws, then remove the cover. Remove the inner rotor and shaft assembly and the outer race.

3. Remove the staking marks at the relief valve chamber cap. Insert a self-threading sheet metal screw of the proper diameter into the oil pressure relief valve chamber cap and pull the cap out of the chamber. Remove the spring and plunger.

CLEANING AND INSPECTION

Refer to Part 8-1, Section 3 for the cleaning and inspection procedures.

ASSEMBLY

The oil pump assembly is shown in Fig. 69.

1. Oil all parts thoroughly.

2. Install the oil pressure relief valve plunger, spring and a new cap. Stake the cap.

3. Install the outer race and the inner rotor and shaft assembly. **Be sure the dimple (identification mark) on the outer race is facing outward and on same side as identification mark on rotor. The inner rotor and shaft and the outer race are serviced as an assembly. One part should not be replaced without replacing the other.** Install the cover. Torque the cover retaining screws to specifications.

4. Position a new gasket and the oil inlet tube on the oil pump and install the retaining bolts.

3 ENGINE REMOVAL AND INSTALLATION

The engine removal and installation procedures are for the engine only without the transmission attached.

390 V-8 ENGINE

REMOVAL

1. Drain the cooling system and the crankcase. Remove the hood. Remove the air cleaner and disconnect the battery positive cable.

2. Disconnect the radiator upper

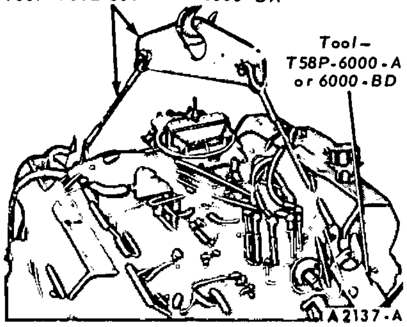

FIG. 70—Typical Engine Lifting Bracket and Sling

hose at the engine and the radiator lower hose at the water pump. On a car with automatic transmission disconnect the transmission oil cooler lines from the radiator.

3. Remove the cooling fan and spacer (or fan drive clutch) and power steering pump drive belt (if so equipped). Remove the radiator. Remove the oil level dipstick.

4. Disconnect the oil pressure sending unit wire at the sending unit and the flexible fuel line at the fuel tank line.

Disconnect the accelerator cable at the carburetor. Remove the accelerator retracting spring. Remove the accelerator cable bracket from the intake manifold. Position the accelerator cable and body ground strap out of the way.

On a vehicle with automatic transmission, disconnect the kickdown rod at the carburetor. Remove the kickdown rod retracting spring. Disconnect the transmission vacuum line at the engine.

On a vehicle with power steering, remove the power steering pump from the mounting bracket. Remove the power steering hose bracket bolt. Wire the power steering pump in a position that will prevent the oil from draining out. Remove the power steering pump bracket, coil bracket, and compressor bracket and compressor assembly (if equipped with air conditioning). Remove the coil. Position the compressor (with lines attached) out of the way. On a vehicle with power brakes, disconnect the brake vacuum hose at the pipe and position the hose out of the way.

5. Disconnect the heater hoses at the water pump and intake manifold and remove the heater hose from the automatic choke bracket. On a 390-2V engine, disconnect the hose at the rear of the coolant heated spacer. Disconnect the coolant temperature sending unit at the sending unit. Remove the wire loom from the clips on the left valve rocker arm cover and position it out of the way.

On a vehicle with air conditioning, remove the compressor from the mounting bracket, and position it out of the way, **leaving the refrigerant lines attached.**

6. Remove the battery ground cable and alternator ground cable bolt at the engine. Remove the alternator mounting bolts and spacer, and position the alternator out of the way.

7. Disconnect the fuel inlet line at the pump.

8. Raise the front of the vehicle. Remove the starter.

9. Disconnect the muffler inlet pipes from the exhaust manifolds.

10. Remove the engine support insulator to intermediate support bracket nuts, and loosen the right side support insulator to engine bolts.

On a vehicle with an automatic transmission, remove the flywheel housing cover. Remove the oil cooler lines retaining clip from the engine block. Disconnect the converter from the flywheel. Secure the converter assembly in the housing. Remove the remaining flywheel housing to engine bolts, and remove the transmission fluid filler tube bracket.

On a vehicle with a manual-shift transmission, remove the flywheel housing inspection cover and the clutch pedal retracting spring. Disconnect the clutch release bracket at the equalizer rod and remove the bracket from the engine. Remove the remaining flywheel housing to engine bolts.

11. Lower the vehicle, then support the transmission. Install the engine left lifting bracket on the front of the left cylinder head, and install the engine right lifting bracket at the rear of the right cylinder head, then attach the engine lifting sling (Fig. 70).

12. Remove the flywheel or converter housing to engine upper bolts.

13. Raise the engine slightly and carefully pull it from the transmission. Lift the engine out of the engine compartment.

INSTALLATION

1. Attach the engine lifting brackets and sling (Fig. 70).

2. Lower the engine carefully into the engine compartment. Make sure the exhaust manifolds are properly aligned with the muffler inlet pipes and the dowels in the block engage the holes in the flywheel housing.

On a vehicle with an automatic transmission, start the converter pilot into the crankshaft.

On a vehicle with a manual-shift transmission, start the transmission main drive gear into the clutch disc. It may be necessary to adjust the position of the transmission in relation to the engine if the input shaft will not enter the clutch disc. **If the engine hangs up after the shaft enters, turn the crankshaft slowly (transmission in gear) until the shaft splines mesh with the clutch disc splines.**

3. Install the flywheel or converter housing upper bolts.

4. Remove the transmission jack. Lower the engine until the front support insulators are properly positioned in the intermediate support brackets. Torque the right side insulator bolts to specifications. Disconnect the engine lifting sling and remove the lifting brackets.

5. Raise the vehicle and install the remaining flywheel housing to engine block retaining bolts. Torque the bolts to specifications.

6. Install the lock washers and nuts on the engine support insulators. Torque both insulator nuts to specifications.

7. Install new muffler inlet pipe gaskets, and connect the muffler inlet pipes to the exhaust manifolds. Torque the nuts to specifications.

8. On a vehicle with an automatic transmission, remove the retainer securing the converter in the housing. Attach the converter to the flywheel. Install the transmission fluid filler tube bracket. Install the flywheel housing cover assembly. Install the oil cooler lines bracket. Connect the kickdown rod to the transmission.

On a vehicle with a manual-shift transmission, install the clutch bracket. Connect the clutch release rod and install the clutch retracting spring. Install the flywheel housing lower cover.

9. Install the starter and transmission oil filler tube bracket. Attach the starter cable.

10. Lower the vehicle. Install the power steering pump bracket, coil bracket, and compressor and bracket assembly (if equipped with air conditioning).

11. Connect the flexible fuel line and the oil pressure sending unit wire.

12. Place the alternator drive belt on the crankshaft pulley. Install the power steering pump and adjust the belt tension to specifications. On a vehicle with air conditioning, install the compressor on the mounting bracket, and adjust the belt tension to specifications.

13. Install the alternator and at-

tach the battery ground cable. Connect the alternator wires and coolant temperature sending unit wire. Connect the heater hoses at the water pump and intake manifold (on 390-2V engines at the rear of the coolant heated spacer).

14. Install the ignition coil and connect the coil primary and high tension wires. Position the wire loom in the retaining clips on the left valve rocker arm cover. Install the oil level dipstick.

15. On a vehicle with an automatic transmission, connect the kickdown rod to the carburetor. Install the kickdown rod retracting spring. Connect the transmission vacuum line.

Install the accelerator cable bracket and body ground strap. Connect the accelerator cable to the carburetor and install the retracting spring.

16. Install the radiator. Connect the radiator upper and lower hoses. Install the hood.

On a vehicle with an automatic transmission, connect the transmission oil cooler lines.

17. Install the fan and spacer (or fan drive clutch). Torque the bolts to specifications. Position the alternator drive belt and adjust the tension to specifications. Tighten the alternator mounting bolts to specifications. Connect the battery positive cable.

On a vehicle with air conditioning, adjust the compressor belt tension to specifications.

18. Fill and bleed the cooling system. Connect the heater hose at the water pump. Fill the crankcase with the proper grade and quantity of oil. Install the hood.

19. Install the air cleaner and operate the engine at fast idle and check all gaskets and hose connections for leaks.

20. Adjust the accelerator cable and the idle speed and fuel mixture.

On a vehicle with an automatic transmission, adjust the transmission control linkage.

427 V-8 ENGINE

REMOVAL

1. Drain the cooling system and the crankcase. Remove the hood and the air cleaner. Disconnect the battery ground cable.

2. Disconnect the radiator upper hose at the engine and the radiator lower hose at the water pump.

3. Remove the radiator. Remove the oil level dipstick.

4. Disconnect the oil pressure sending unit wire at the sending unit, and the flexible fuel line at the fuel tank line. Plug the fuel tank line.

5. Disconnect the accelerator rod at the carburetor. Remove the accelerator retracting spring.

6. Disconnect the heater hoses at the water pump and intake manifold, the alternator wires at the alternator, and the water temperature sending unit at the sending unit.

7. Disconnect the wire loom at the distributor and ignition coil. Remove the wire loom from the clips on the left valve rocker arm cover and position it out of the way.

8. Remove the flywheel housing to engine upper bolts.

9. Raise the front of the vehicle. Disconnect the muffler inlet pipe at the right exhaust manifold. Remove the heat control valve.

10. Disconnect the engine front support insulators at the frame. Raise the engine approximately 1 or 2 inches to provide necessary clearance to remove the right exhaust manifold.

11. Remove the right exhaust manifold. Disconnect the muffler inlet pipe at the left exhaust manifold.

12. Disconnect the starter cable. Remove the starter.

13. Remove the flywheel housing inspection cover and the clutch pedal retracting spring. Disconnect the clutch release bracket at the equalizer rod and remove the bracket from the engine. Remove the remaining flywheel housing to engine bolts.

14. Lower the vehicle and support the transmission. Install the engine left lifting bracket on the front of the left cylinder head, and install the engine right lifting bracket at the rear of the right cylinder head, then attach the engine lifting sling (Fig. 70).

15. Raise the engine slightly and carefully pull it from the transmission. Lift the engine out of the engine compartment.

INSTALLATION

1. Clean the muffler inlet pipe gasket surfaces and both sides of the exhaust control valve assembly.

2. Attach the engine lifting brackets and sling (Fig. 70).

3. Lower the engine carefully into the engine compartment. Make sure the exhaust manifolds are properly aligned with the muffler inlet pipes and the dowels in the block engage the holes in the flywheel housing.

4. Start the transmission main drive gear into the clutch disc. It may be necessary to adjust the position of the transmission in relation to the engine if the input shaft will not enter the clutch disc. **If the engine hangs up after the shaft enters, turn the crankshaft slowly (transmission in gear) until the shaft splines mesh with the clutch disc splines.**

5. Install the flywheel housing upper bolts. Install the remaining flywheel housing to engine block retaining bolts.

6. Raise the front of the vehicle. Install the starter. Connect the starter cable.

7. Raise the engine approximately 1 or 2 inches and position the right exhaust manifold. Install and torque the retaining bolts to specifications.

8. Make sure the engine support insulator bolts are properly aligned with the support brackets on the frame. Completely lower the engine and install the engine support insulator lock washers and nuts. Torque the nuts to specifications.

9. Disconnect the engine lifting sling and remove the lifting brackets.

10. Place new gaskets on both sides of the exhaust control valve and position it over the inlet pipe studs on the right exhaust manifold. Connect the muffler inlet pipe to the exhaust manifold and torque the nuts to specifications.

11. Position a new gasket to the left exhaust manifold and connect the muffler inlet pipe to the manifold. Install and torque the nuts to specifications.

12. Install the clutch bracket. Connect the clutch release rod and install the clutch retracting spring. Install the flywheel housing lower cover.

13. Remove the support from the transmission and lower the vehicle.

14. Connect the alternator wires, the water temperature sending unit wire, and connect the heater hose at the intake manifold. Connect the battery ground cable.

15. Connect the flexible fuel line and the oil pressure sending unit wire.

16. Connect the coil primary and high tension wires. Connect the wire loom at the distributor. Position the wire loom in the retaining clips on the left valve rocker arm cover.

17. Install the oil level dipstick. Install the accelerator retracting spring. Connect the accelerator rod and adjust the accelerator linkage.

18. Install the radiator. Connect the radiator upper and lower hoses. Install the hood.

19. Fill and bleed the cooling sys-

tem. Connect the heater hose at the water pump. Fill the crankcase with the proper grade and quantity of oil.

20. Install the air cleaner, and operate the engine at fast idle and check all gaskets and hose connections for leaks.

4 MAJOR REPAIR OPERATIONS

To perform the operations in this section, it will be necessary to remove the engine from the vehicle and install it on a work stand. For engine removal and installation procedures, refer to Section 3.

When installing nuts or bolts that must be torqued (refer to Part 8-5 for torque specifications), oil the threads with light weight engine oil. **Do not oil threads that require oil-resistant or water-resistant sealer.**

CRANKSHAFT

The crankshaft and related parts are shown in Fig. 71.

REMOVAL

1. Install the engine on a work stand. Remove the spark plugs to allow easy rotation of the crankshaft.

2. Remove the fuel pump. Slide the water pump bypass hose clamp toward the intake manifold. Remove the water pump.

3. Remove the accessory drive pulley (if so equipped). Remove the crankshaft damper cap screw and washer. Remove the power steering drive pulley. Install the puller on the damper (Fig. 41) and remove the damper.

4. Remove the crankshaft sleeve as shown in Fig. 42.

5. Remove the carburetor fuel inlet line. Remove the fuel pump. Remove the cylinder front cover and air conditioning idler pulley assembly (if so equipped). Remove the cover gasket.

6. Remove the crankshaft front oil slinger. Check the timing chain deflection, then remove the timing chain and sprockets by following the applicable steps under Cylinder Front Cover Removal.

7. Invert the engine on the work stand. Remove the flywheel, and engine rear cover plate. Remove the oil pan and gasket. Remove the oil pump and inlet tube and screen assembly.

8. Make sure all bearing caps (main and connecting rods) are marked so that they can be installed in their original locations. Remove the connecting rod bearing caps. Turn the crankshaft until the connecting rod from which the cap is being removed is down and remove the cap. Push the connecting rod and piston assembly up into the cylinder.

9. Remove the main bearing caps.

On a 427 V-8, remove the main bearing cap cross bolts, washers and spacers (Fig. 55) before removing the cap retaining bolts.

10. Carefully lift the crankshaft out of the block so that the thrust bearing surfaces are not damaged. **Handle the crankshaft with care to avoid possible fracture or damage to the finished surfaces.**

CLEANING AND INSPECTION

Refer to Part 8-1, Section 3 for the cleaning and inspection procedures. **Be sure the oil seal surfaces**

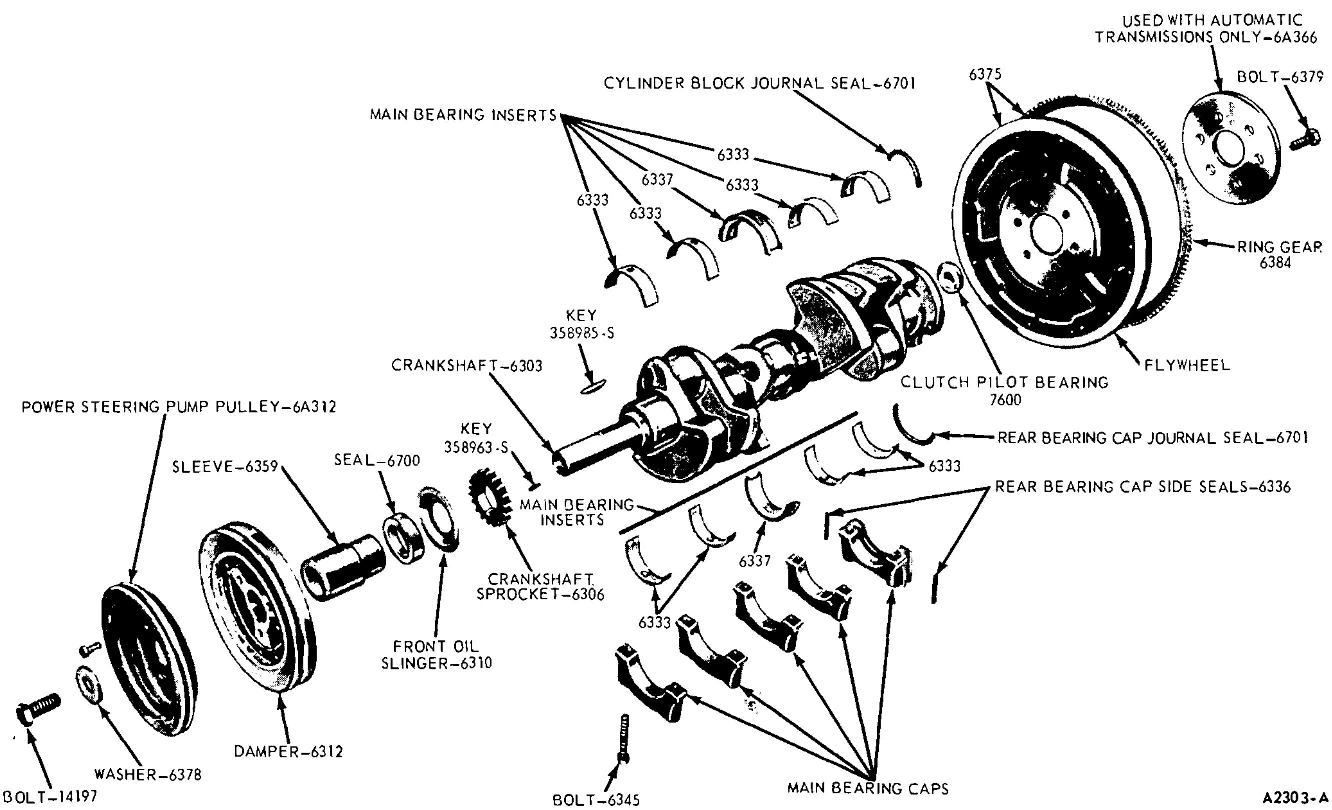

FIG. 71—Typical Crankshaft and Related Parts

on the crankshaft and crankshaft damper are properly cleaned.

REPAIRS

To refinish journals, dress minor imperfections, etc., refer to Part 8-1, Section 2.

INSTALLATION

1. Remove the rear journal oil seal from the block and rear main bearing cap. Remove the rear main bearing cap to block side seals.

2. Remove the main bearing inserts from the block and bearing caps.

3. Remove the connecting rod bearing inserts from the connecting rods and caps.

4. If the crankshaft main bearing journals have been refinished to a definite undersize, install the correct undersize bearings. Be sure the bearing inserts and bearing bores are clean. Foreign material under the inserts will distort the bearing and cause a failure.

5. Place the upper main bearing inserts in position in the bores with the tang fitting in the slot provided.

If the oil hole does not line up with the cylinder block oil passage, check the holes with a rod corresponding to the following diameters:

No. 1 Bearing—7/64 inch
No. 2 Bearing—9/64 inch
No. 3 Bearing—9/32 inch
No. 4 Bearing—5/32 inch
No. 5 Bearing—9/32 inch

If the rod passes through both the bearing and the block, sufficient lubrication is assured.

6. Install the lower main bearing inserts in the bearing caps.

7. Carefully lower the crankshaft into place. **Be careful not to damage the bearing surfaces.**

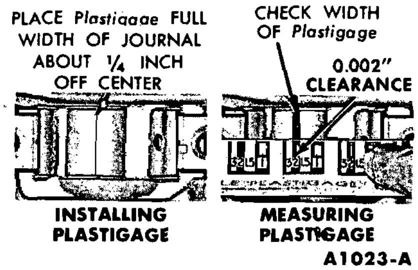

FIG. 72—Installing and Measuring Plastigage—Engine on Work Stand

8. Dip the seal halves in clean engine oil. Carefully install the upper seal (cylinder block) into its groove with undercut side of seal toward the FRONT of the engine (Fig. 54), such that approximately 0.375 inch protrudes above the parting surface.

9. Check the clearance of each main bearing as follows:

Place a piece of Plastigage on the crankshaft journal the full width of the journal and about 1/4 inch off-center (Fig. 72). Follow steps 10 and 11 under Main Bearing Replacement in Part 8-2, Section 2.

10. After the bearings have been fitted, apply a light coat of engine oil to the journals and bearings.

11. Install the lower seal in the rear main bearing cap with undercut side of seal toward the FRONT of the engine (Fig. 54), allow the seal to protrude approximately 0.375 inch above the parting surface to mate with the upper seal when the cap is installed.

12. Apply a thin coating of oil-resistant sealer to the rear main bearing cap at the rear of the top mating surface. **Do not apply sealer to the area forward of the side seal groove.** Install the rear main bearing cap. Torque the cap bolts to specifications.

13. Dip the side seals in light engine oil; then immediately install them in the grooves. **Do not use sealer on the side seals. The seals are designed to expand when dipped in oil. Using sealer may retard this expansion.** It may be necessary to tap the seals into place for the last 1/2 inch of travel. Do not cut the seal projecting ends.

14. Check the retainer side seals for leaks by squirting a few drops of oil into the parting lines between the rear main bearing cap and the cylinder block from the outside. Blow compressed air against the seals from the inside of the block. If air bubbles appear in the oil, it indicates possible oil leakage. **This test should not be performed on newly installed seals until sufficient time has been allowed for the seals to expand into the seal grooves.**

15. Install all the bearing caps, except the thrust bearing cap (No. 3 bearing). **Be sure that the main bearing caps are installed in their original locations.** Torque the bearing cap bolts to specifications.

On a 427 V-8 install the main bearing caps, following the procedure in step 15 of Engine Assembly.

16. Install the thrust bearing cap with the bolts finger-tight.

17. Pry the crankshaft forward against the thrust surface of the upper half of the bearing (Fig. 73).

18. Hold the crankshaft forward and pry the thrust bearing cap to the rear (Fig. 73). This will align the thrust surfaces of both halves of the bearing.

19. Retain the forward pressure on the crankshaft. Torque the cap bolts to specifications (Fig. 73).

20. Check the crankshaft end play by following the procedure in Part 8-1, Section 1.

21. Install new bearing inserts in

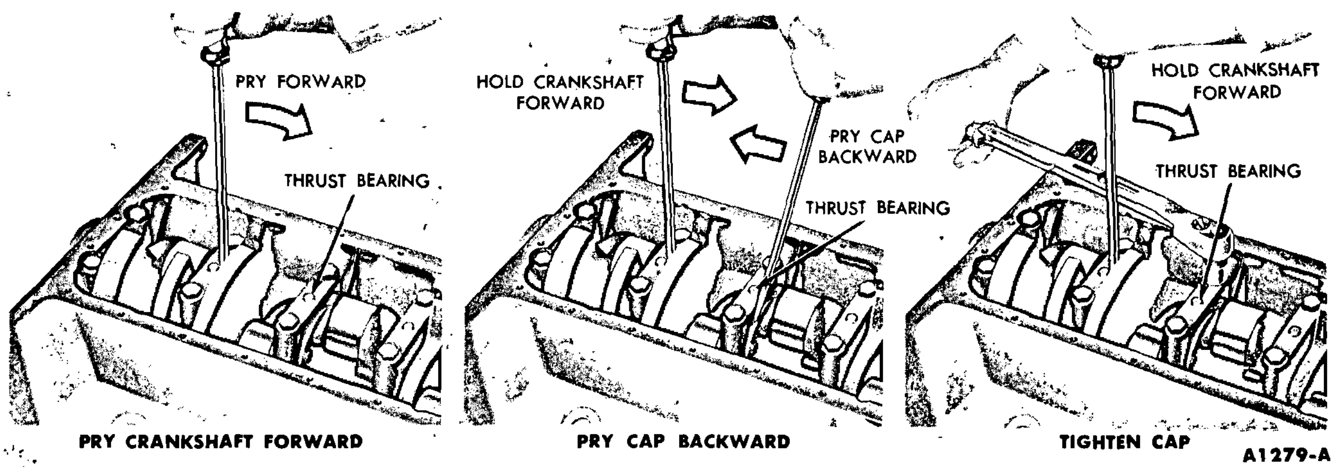

FIG. 73—Thrust Bearing Alignment

the connecting rods and caps. Check the clearance of each bearing following the procedure under Main Bearing Replacement.

22. After the connecting rod bearings have been fitted, apply a light coat of engine oil to the journals and bearings.

23. Turn the crankshaft throw to the bottom of its stroke. Push the piston all the way down until the rod bearing seats on the crankshaft journal.

24. Install the connecting rod cap. Torque the nuts to specifications.

25. After the piston and connecting rod assemblies have been installed, check the side clearance between the connecting rods on each connecting rod crankshaft journal (Fig. 60).

26. Install the engine rear cover plate; then position the flywheel on the crankshaft. Install the retaining bolts. Torque the bolts to specifications.

On a flywheel for a manual-shift transmission, use tool 7563 to locate the clutch disc. Install the pressure plate. Tighten the retaining bolts.

27. Install the timing chain and sprockets, cylinder front cover and crankshaft damper, following steps 1 thru 9 under Cylinder Front Cover Installation.

28. Clean the oil pan, oil pump and oil pump screen. Prime the oil pump by filling the inlet opening with oil and rotating the pump shaft until oil emerges from the outlet opening. Install the oil pump and oil pan.

29. Install the oil filter, fuel pump and carburetor fuel inlet line. Install the spark plugs.

30. Remove the engine from the work stand.

CAMSHAFT BEARING REPLACEMENT

Camshaft bearings are available pre-finished to size or standard and 0.015-inch undersize journal diameters. The bearings are not interchangeable from one bore to another.

1. Install the engine on a work stand. Remove the camshaft, flywheel and crankshaft. Push the pistons to the top of the cylinders.

2. Remove the camshaft rear bearing bore plug. Remove the camshaft bearings (Fig. 74).

If the camshaft bearings are being removed with the tool shown in Fig. 74, the following procedure will apply. Select the proper size expanding collet and back-up nut and assemble on the expanding mandrel. With the expanding collect collapsed, install the collet assembly in the camshaft bearing, and tighten the back-up nut on the expanding mandrel until the collet fits the camshaft bearing. Assemble the puller screw and extension (if necessary) as shown and install on the expanding mandrel. Tighten the pulling nut against the thrust bearing and pulling plate to remove the camshaft bearing. Be sure to hold a wrench on the end of the puller screw to prevent it from turning. Repeat the procedure for each bearing. To remove the front bearing, install the puller screw from the rear of the cylinder block.

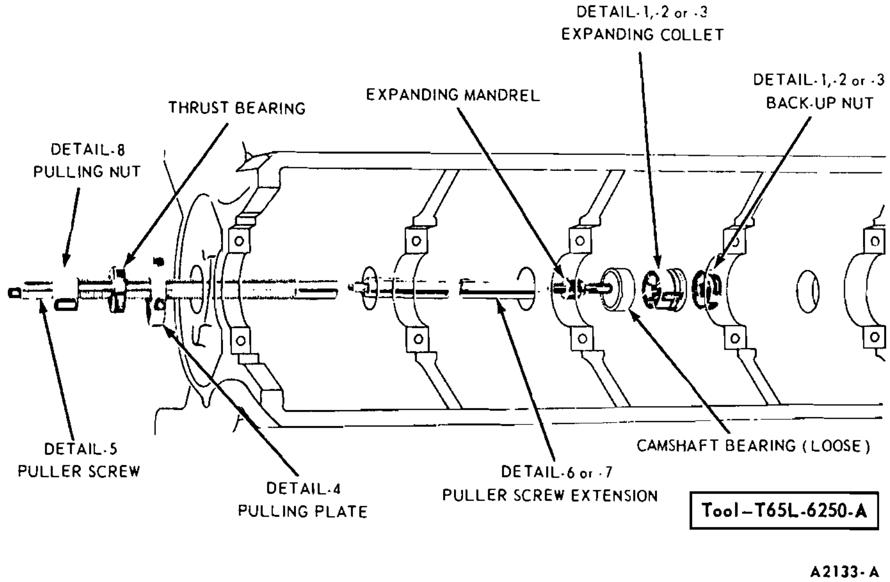

FIG. 74—Typical Camshaft Bearing Replacement

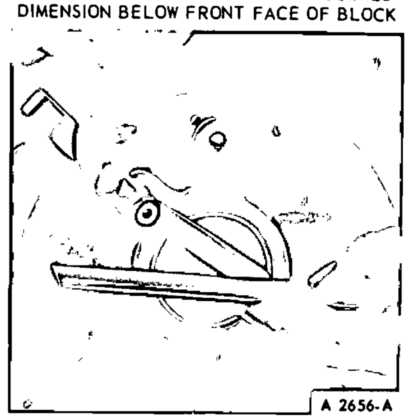

FIG. 75.—Camshaft Front Bearing Measurement

3. Position the new bearing at the bearing bores, and press them in place with the tool shown in Fig. 74. Be sure to center the pulling plate and the puller screw to avoid damage to the bearing. Wrap a cloth around the threads of the puller screw to protect the front bearing or journal. **Failure to use the correct expanding collet can cause severe bearing damage.** Align the oil holes in the bearings with the oil holes in the cylinder block when the bearings are installed. **Be sure the front bearing is installed below the front face of the cylinder block (Fig. 75) to specifications.**

4. Clean out the camshaft rear bearing bore plug recess throughly. Coat the flange of a new plug with oil-resistant sealer and install the plug, with the flange edge of the plug facing inward (Fig. 50).

5. Install the camshaft, crankshaft, flywheel and related parts, following the appropriate procedures in Section 2 or Section 4, except do not check the connecting rod and main bearing clearances as a part of Camshaft Bearing Replacement. Remove the engine from the work stand.

CYLINDER ASSEMBLY REPLACEMENT

DISASSEMBLY

Follow steps 1 thru 11, 13 thru 20, and 24 thru 26 under Engine Disassembly. Remove the cylinder head dowels from the cylinder block. Remove the cylinder block drain plugs and remove the cylinder assembly from the work stand.

CLEANING

Clean the gasket and seal surfaces of all parts and assemblies (refer to Part 8-1, Section 3).

ASSEMBLY

Install the replacement cylinder block assembly on a work stand. Install the cylinder block drain plugs and cylinder head dowels. Transfer all parts removed from the old cylinder assembly to the new cylinder assembly, following the procedures in steps 22 thru 34 and 41 thru 62, under Engine Assembly. Check all assembly clearances.

CYLINDER BLOCK REPLACEMENT

DISASSEMBLY

Follow steps 1 thru 34 under Engine Disassembly. Remove the cylinder head dowels and cylinder block drain plugs. Remove the intake and exhaust manifolds and cylinder head as an assembly. Remove the cylinder block from the work stand.

CLEANING

Clean the gasket and seal surfaces of all parts and assemblies (Part 8-1, Section 3).

ASSEMBLY

Install the replacement cylinder block on a work stand. Install the cylinder block drain plugs and cylinder head dowels. Transfer all parts removed from the old cylinder block to the new cylinder block, following steps 7 thru 62. Check all assembly clearances. Install the manifolds and cylinder head as an assembly.

ENGINE DISASSEMBLY

1. Install the engine on the work stand.

2. Remove the distributor cap and spark plug wire assembly.

3. Disconnect the distributor vacuum hose at the distributor on the 390 V-8. Remove the carburetor fuel inlet line. Remove the fuel pump and discard the gasket.

4. Slide the clamp on the water pump by-pass hose toward the water pump. Remove the automatic choke air heat tube and air inlet tube. On a vehicle with Thermactor exhaust emission control system disconnect the air and vacuum lines. Remove the air supply pump, air manifold assembly, air cleaner assembly, backfire suppressor valve, and air and vacuum lines and brackets. Remove the valve rocker arm covers and positive crankcase ventilation system components.

On an engine with mechanical lifters, loosen the valve rocker arm shaft support bolts in sequence, two turns at a time. After all the bolts are loosened, remove the valve rocker arm shaft assembly.

On an engine with hydraulic valve lifters, starting at the No. 4 cylinder, loosen the right rocker arm shaft support bolts in sequence, two turns at a time. After the bolts are all loosened, remove the valve rocker arm shaft assembly and the oil baffle plate. Starting at the No. 5 cylinder, follow the same procedure on the left valve rocker arm shaft support bolts.

5. Remove the valve push rods in sequence and put them in a rack so that they can be installed in their original bore.

6. Remove the distributor hold down bolt and clamp and remove the distributor.

7. Remove the intake manifold retaining bolts.

8. Install standard eye bolts with 5/16-18 threads in the left front and right rear rocker arm cover screw holes and attach the engine lifting sling (Fig. 30).

9. Raise the intake manifold and carefully remove it from the engine. Discard the intake manifold gaskets and seals.

10. Remove the baffle plate from the valve push rod chamber floor by prying up on the baffle with a screwdriver (Fig. 76).

11. Lift the valve lifters or tappets from the cylinder block and place them in a rack so that they can be installed in their original bore (Fig. 77).

The internal parts of each hydraulic valve lifter assembly are matched sets. Do not intermix the parts. Keep the assemblies intact until they are to be cleaned.

12. Remove the exhaust manifolds and the spark plugs. Remove the automatic choke air chamber cover from the right exhaust manifold.

13. Remove the cylinder head bolts.

14. Lift the cylinder heads off the block. **Do not pry between the head and the block.** Discard the cylinder head gaskets.

15. Remove the oil filter. Remove the oil filter adapter assembly and oil pressure sending unit as an assembly. Discard the gasket.

16. Remove the alternator, bracket and drive belt.

17. Remove the water pump, pulley and fan as an assembly. Remove the accessory drive pulley (if so equipped).

18. On a vehicle with power steering, remove the power steering pulley. Remove the damper (Fig. 41).

19. Remove the crankshaft sleeve as shown in Fig. 42.

20. Remove the cylinder front cover. Discard the gasket. Remove the crankshaft front oil slinger.

21. Check the timing chain deflection by following the procedure in Part 8-1, Section 1.

22. Remove the camshaft sprocket cap screw and the fuel pump eccentric. Remove the sprockets and timing chain as an assembly (Fig. 44. Remove the crankshaft sprocket key.

23. Remove any ridge and/or carbon deposits from the upper end of the cylinder bores. Move the piston to the bottom of its travel and place a cloth on the piston head to collect the cuttings. Remove the cylinder ridge with a ridge cutter. Follow the instructions furnished by the tool manufacturer. **Never cut into the ring travel area in excess of 1/32 inch when removing ridges.** After the ridge has been removed, remove the cutter from the cylinder bore.

24. On a flywheel for a manual-shift transmission, mark the pressure plate cover so that it can be replaced in the same position, and remove the clutch pressure plate and cover assembly. Remove the flywheel. Remove the rear cover plate.

25. Invert the engine. Remove the oil pan. Discard the gasket.

26. Remove the oil pump and inlet tube as an assembly. Remove the oil pump intermediate shaft. Discard the oil pump gasket.

27. Make sure all connecting rods and caps are marked so that they can be installed in their original locations. Turn the crankshaft until the connecting rod being removed is down. Remove the rod cap.

28. Push the connecting rod and piston assembly out the top of the cylinder with the handle end of a hammer. **Avoid damage to the connecting rod journal or the cylinder wall when removing the piston and rod.**

29. Remove the bearing inserts from the connecting rods and caps. Install the rod caps on the connecting rods from which they were removed.

30. Remove the main bearing caps.

On the 427 V-8, remove the main bearing cap cross-bolts, washers and spacers (Fig. 55) before removing the cap retaining bolts.

31. Carefully lift the crankshaft out of the cylinder block so that the thrust bearing surfaces are not damaged. **Handle the crankshaft with**

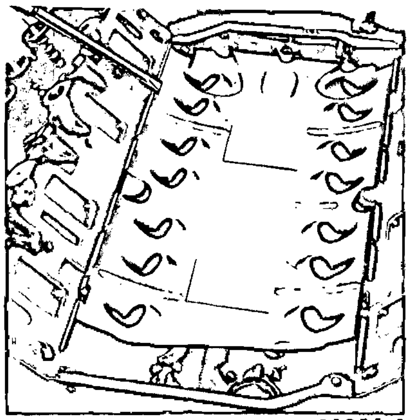

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FIG. 76—Baffle Plate Removal

care to avoid possible fracture or damage to the finished surfaces.

32. Remove the rear journal oil seal from the block and rear bearing cap and remove the cap to block side seals.

33. Remove the main bearing inserts from the block and bearing caps. Install the main bearing caps in their original positions.

34. Carefully remove the camshaft. Avoid damaging the journals and lobes.

35. Remove the camshaft rear bearing bore plug. Remove the camshaft bearings (Fig. 74).

CLEANING AND INSPECTION

For cleaning and inspection procedures, refer to Part 8-1, Section 3.

ENGINE ASSEMBLY

If the cylinder block is to be replaced, transfer the cylinder head dowels and cylinder block drain plugs to the new cylinder block. Also, omit steps 1 thru 6 below, if a new cylinder block is used.

1. If the original cylinder block is used, remove the glaze from the cylinder bores by following the instructions of the tool manufacturer.

2. Invert the engine on the work stand.

3. Position the new camshaft bearings at the bearing bores and press them in place with the tool shown in Fig. 74. Align the oil holes in the cylinder block when the bearings are installed. **Be sure the camshaft front bearing is installed below the front face of the cylinder block (Fig. 75) to specifications.**

4. Check the oil passage that feeds the rocker arm shafts for obstructions by squirting oil into the opening on each cylinder bank and observing the flow through the oil holes at Nos. 2 and 4 bearings.

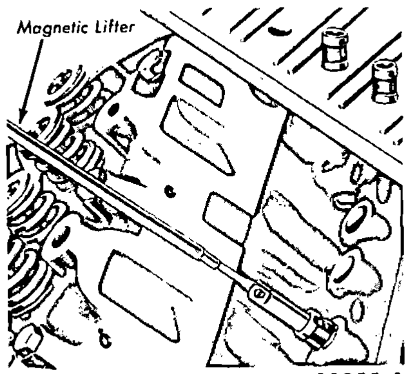

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FIG. 77—Valve Lifter or Tappet Removal—Intake Manifold Removed

5. Clean out the camshaft rear bearing bore plug recess thoroughly.

6. Coat the flange of a new plug with oil-resistant sealer and install it with the flange facing inward (Fig. 50). Drive the plug in until it is flush or slightly below the casting surface.

7. Oil the camshaft journals and apply Lubriplate to all lobes; then carefully slide it through the bearings. Check the camshaft end play and correct as required.

8. If the crankshaft main bearing journals have been refinished to a definite undersize, install the correct undersize bearings. Be sure the bearing inserts and bearing bores are clean. Foreign material under the inserts will distort the bearing and cause a failure.

Place the upper main bearing inserts in position in the bore with the tang fitting in the slot provided.

9. Install the lower main bearing inserts in the bearing caps.

10. Carefully lower the crankshaft into place. **Be careful not to damage the bearing surfaces.**

11. Be sure that the rear oil seal grooves are clean. Dip the seal halves in clean engine oil. Carefully install the upper seal (cylinder block) into its groove with undercut side of seal toward the FRONT of the engine (Fig. 54), such that approximately 0.375 protrudes below the parting surface.

12. Check the clearance of each main bearing following the procedure under Main Bearing Replacement.

13. After the bearings have been fitted, apply a light coat of engine oil to the journals and bearings.

14. Be sure that the oil seal grooves in the rear main bearing cap are clean. Install the lower seal in the rear main bearing cap with the seal lip toward the FRONT of the engine (Fig. 54), allow the seal to protrude approximately 0.375 inch above the parting surface to mate with the upper seal when the cap is installed. Apply a thin coating of oil-resistant sealer to the rear main bearing cap at the rear of the top mating surface (Fig. 48). **Do not apply sealer to the area forward of the side seal groove.**

15. Install the rear main bearing cap and the remainder of the caps, except the thrust bearing cap (No. 3 bearing). **Be sure that the main bearing caps are installed in their original locations.** Torque the bearing cap bolts to specifications.

16. Dip the side seals in light engine oil; then immediately install them in the grooves. **Do not use sealer on the side seals. The seals are designed to expand when dipped in oil. Using sealer may retard this expansion.** It may be necessary to tap the seals into place for the last 1/2 inch of travel. Do not cut the seal projecting ends.

17. Check the retainer side seals for leaks by squirting a few drops of oil into the parting lines between the rear main bearing cap and the cylinder block from the outside. Blow compressed air against the seals from the inside of the block. If air bubbles appear in the oil, it indicates possible oil leakage. **This test should not be performed on newly installed seals until sufficient time has been allowed for the seals to expand into the seal grooves.**

18. Install the thrust bearing cap following steps 11 thru 14 under Crankshaft Installation. Check the crankshaft end play by following the procedure in Part 8-1, Section 1.

19. On a 427 V-8, torque the main bearing cap bolts to specifications.

Make sure the cross-bolt spacers are installed in their proper locations (Fig. 55). Production spacers are marked L-2, R-2, L-3, R-3, L-4 and R-4.

Install and torque the cross-bolts in two steps, following the sequence shown in Fig. 55. First, torque all the cross-bolts to 20 ft-lbs. Finally, torque all the cross-bolts to 40 ft-lbs.

20. Turn the engine on the work stand so that the front end is up.

21. Install the pistons and connecting rods by following steps 1 thru 9 under Piston and Connecting Rod Assembly Installation.

22. Position the sprockets and timing chain on the camshaft and crankshaft (Fig. 44). Be sure the

timing marks on the sprockets are positioned as shown in Fig. 43.

23. Lubricate the timing chain and sprockets with engine oil.

24. Install the fuel pump eccentric (Fig. 46) and the camshaft sprocket cap screw. Torque the sprocket cap screw to specifications. Install the crankshaft front oil slinger.

25. Clean the cylinder front cover and the cylinder block gasket surfaces. Grease and install a new crankshaft front oil seal (Fig. 45).

26. Coat the gasket surface of the block and cover and the cover bolt threads with sealer. Position a new gasket on the block.

27. Install the alignment pilot tool on the cylinder front cover so that the keyway in the pilot aligns with the key in the crankshaft. Position the cover and pilot over the end of the crankshaft and against the block (Fig. 47).

28. Install the cylinder front cover bolts finger-tight. While pushing in on the pilot, torque the cover bolts to specifications. Remove the pilot.

29. Apply Lubriplate to the outer surface of the crankshaft sleeve, and install the sleeve.

30. Apply a white lead and oil mixture to the inside diameter of the crankshaft damper.

31. Line up the damper keyway with the key on the crankshaft, and install the damper on the crankshaft (Fig. 48). Install the power steering pulley on the crankshaft damper. Install the damper cap screw and washer, and torque the screw to specifications.

32. Clean the water pump gasket surfaces and apply sealer. Position new gaskets on the pump and install the water pump, pulley, and fan as an assembly.

33. Using a new gasket, install the fuel pump.

34. Turn the engine on the work stand so that the top of the engine is up.

35. Clean the cylinder head and block gasket surfaces. On a 427 engine apply sealer to both sides of a new gasket. All other engines use a specially treated composition gasket. **Do not apply sealer to the composition cylinder head gasket.** Guided by the word FRONT on the gasket, install the head gasket over the cylinder head dowels.

36. Place the cylinder head on the engine. Install the bolts.

37. The cylinder head bolt tightening procedure is performed in three progressive steps. Torque the bolts in sequence (Fig. 33) to 70 ft-lbs, then to 80 ft-lbs; and finally to specifications. When cylinder head bolts have been tightened following this procedure, it is not necessary to retorque the bolts after extended operation. However, on cylinder heads with composition gaskets, the bolts may be checked and retorqued, if required. **After the cylinder head bolts have been torqued to specifications, the bolts should not be disturbed on 427 engines.**

38. Coat the mating surfaces of the exhaust manifold with a light film of graphite grease.

39. Using a new gasket, install the automatic choke air chamber cover on the right exhaust manifold. **Be sure the cover is securely fastened.**

40. Position a new gasket over the muffler inlet pipe studs of the exhaust manifolds.

41. Position the exhaust manifolds on the cylinder heads and install the retaining bolts and tabwashers.

On a 427 V-8, do not install the right exhaust manifold until the engine has been installed in the car. Refer to Engine Installation.

Torque the retaining bolts to specifications, working from the center to the ends. Lock the bolts by bending one tab of the washer over a flat on the bolt.

42. Install the spark plugs.

43. Invert the engine on the work stand. Position the oil pump drive shaft into the distributor socket. With the shaft firmly seated in the distributor socket, the stop on the shaft should touch the roof of the crankcase. Remove the shaft and position the stop as necessary.

44. With the stop properly positioned, insert the oil pump drive shaft into the oil pump.

45. Prime the oil pump by filling either the inlet or outlet port with engine oil. Rotate the pump shaft to distribute the oil within the pump body.

46. Position a new gasket on the pump housing and install the pump and shaft as an assembly. **Do not attempt to force the pump into position if it will not seat readily. The drive shaft hex may be misaligned with the distributor shaft. To align, rotate the intermediate shaft into a new position.**

47. Position a new gasket on the oil pan and place the oil pan assembly on the block. Install the retaining screws and torque them from the center outward to specifications.

48. Invert the engine on the work stand. Install the baffle plate in the valve push rod chamber. Position one side of the baffle plate and press the other side into place.

On an engine with hydraulic valve lifters use the hydraulic valve lifter leakdown tester (Part 8-1) to fill the lifters with test fluid. Coat the outside of each valve lifter with engine oil to provide initial lubrication. Place each lifter in the bore from which it was removed.

On an engine with mechanical lifters, coat each tappet with engine oil and install them in the bores from which they were removed.

49. Clean the mating surfaces of the intake manifold, cylinder heads and cylinder block. Use a suitable solvent to remove all traces of oil.

50. Coat the intake manifold and cylinder block seal surfaces with a quick-setting seal adhesive. Apply a non-hardening sealer to the mating lines of the cylinder heads and cylinder block.

51. Position new seals on the cylinder block and new gaskets on the cylinder heads. **Be sure the seals are properly positioned during installation as the adhesive sticks to the seals immediately on contact.** Position the manifold gasket slots over the end tabs on the seals. Coat these four connections with a non-hardening sealer. Be sure the holes in the gaskets are aligned with the holes in the cylinder heads.

52. Install the eye bolts in the intake manifold and attach the engine lifting sling and carefully lower the intake manifold on the engine (Fig. 30).

53. Position the intake manifold. **After the intake manifold is in place, run a finger around the seal area to make sure the seals are in place. If seals are not in place, remove the intake manifold and position the seals.**

54. Start the water pump bypass hose on the intake manifold.

55. Be sure the holes in the manifold gaskets and manifold are in alignment. Apply a non-hardening, oil-resistant sealer to the under side of each manifold retaining bolt head. Install the manifold retaining bolts and torque them to specifications, in sequence as shown in Fig. 32.

56. Remove the engine lifting sling and eye bolts.

57. Refer to Valve Rocker Arm Shaft Assembly Installation and install the valve rocker arm shaft assemblies by following steps 1 thru 9.

On an engine with mechanical lifters, it is necessary to perform a final (hot) valve lash adjustment after the engine is installed in the vehicle.

58. Install the automatic choke air heat tube and air inlet tube.

59. Rotate the crankshaft damper until the No. 1 piston is on TDC of the compression stroke; then position the distributor in the block with the

rotor at the No. 1 firing position and the points open. Install the hold down clamp.

60. Install the distributor cap and spark plug wire assembly. Connect the spark plug wires.

61. Install the carburetor fuel inlet line at the fuel pump, and using a new clamp, connect the line at the fuel filter.

62. Install the engine rear cover plate. Position the flywheel on the crankshaft and install the retaining bolts. Torque the bolts alternately to specifications.

On a flywheel for a manual-shift transmission, use tool 7563-E to locate the clutch disc. Install the pressure plate.

63. Clean the oil filter adapter gasket surfaces. Apply oil-resistant sealer to a new adapter gasket, and install the adapter assembly and gasket.

64. Clean the adapter filter recess. Coat the gasket on a new filter with oil. Place the filter in position on the adapter. Hand tighten the filter until the gasket contacts the adapter face, and advance it 1/2-turn.

On a vehicle with Thermactor exhaust emission control system, install the anti-backfire valve, air manifold assembly and air supply pump. Install the air and vacuum lines and brackets.

65. Remove the engine from the work stand, and install it in the vehicle. Install the air cleaner; then operate the engine and check for oil and coolant leaks. Check the ignition timing; adjust the engine idle speed, idle fuel mixture, accelerator cable, and anti-stall dashpot (if applicable). Connect the distributor vacuum hose on 390 V-8.

On a vehicle with an automatic transmission, adjust the transmission control linkage.

On an engine with mechanical valve lifters, perform a final (hot) valve lash adjustment. Install the valve rocker arm covers.

PART 8-5—Specifications

ENGINE IDENTIFICATION AND APPLICATION

Engine	Warranty Plate Code	Mercury Inter-Mediate	Cougar	Falcon	Fairlane	Fairlane Ranchero	Mustang
170 Six (1-V)	U			X			
200 Six (1-V)	T	X		X	X	X	X
289 V-8 (2-V)	C	X	X	X	X	X	X
289 V-8 (4-V)	A		X	X			X
289 V-8 (4-V) ①	K						X
390 V-8 (2-V)	Y	X			X	X	
390 V-8 (2-V)	H	X			X	X	
390 V-8 (4-V) ②	S	X	X		X	X	X
427 V-8 (4-V) ①	W	X			X		
427 V-8 (8-V) ①	R	X			X		

① High-Performance ② GT

GENERAL SPECIFICATIONS

Engine ②	Compression Ratio	Bore and Stroke	Taxable Horsepower ①	Brake Horsepower ①	Gross Torque Ft-Lbs ①	Compression Pressure PSI (Sea Level) @ Cranking Speed ③
170 Six (Falcon)	9.1:1	3.50 x 2.94	29.40	105 @ 4400	158 @ 2400	–195
200 Six	9.2:1	3.68 x 3.13	32.50	120 @ 4400	190 @ 2400	
289 V-8 (2V)	9.3:1	4.00 x 2.87	51.20	200 @ 4400	282 @ 2400	130–170
289 V-8 (4V)	9.8:1			225 @ 4800	305 @ 3200	
289 V-8 (4V) HP	10.5:1			271 @ 6000	312 @ 3400	
390 V-8 (2V)	9.5:1	4.05 x 3.78		270 @ 4400	403 @ 2600	160–200
390 V-8 (4V) (GT)	10.5:1	4.05 x 3.78	52.49	320 @ 4800	427 @ 3200	170–210
427 V-8 (4V) HP	11.1:1	4.23 x 3.78	57.33	410 @ 5600	476 @ 3400	160–200
427 V-8 (8V) HP	11.1:1	4.23 x 3.78	57.33	425 @ 6000	480 @ 3700	160–200

① @ Specified rpm ② Engine No. shown is the piston displacement in cubic inches
③ Allowable tolerance between cylinders – 20 psi

GENERAL SPECIFICATIONS (CONTINUED)

Engine	Engine Idle RPM—With Lights On ①				Engine Idle Manifold Vacuum	Oil Pressure—Hot @ 2000 RPM	Firing Order
	Without Exhaust Emission		With Exhaust Emission				
	Standard Transmission	Automatic Transmission	Standard Transmission	Automatic Transmission			
170, 200 Six	575	550	700 for 200	550	17	35–55 psi	1-5-3-6-2-4
289 V-8 (2V)	575	475	625	550	18	35–55 psi	1-5-4-2-6-3-7-8
289 V-8 (4V)	600	525	625	550	18	35–55 psi	
289 V-8 (4V) HP	750	650	–	–	15	35–55 psi	
390 V-8 (2V)	575	475	625	550	17	35–65 psi	
390 V-8 (4V) GT	600	525	625	550	17	35–65 psi	
427 V-8	750	–	–	–	15	40–55 psi	

① On A/C equipped vehicles the engine idle speed should be set with the air conditioner in operation for a minimum of 20 minutes

CYLINDER HEAD

Engine	Combustion Chamber Volume	Valve Guide Bore Diameter (Standard Intake and Exhaust	Valve Seat Width		Valve Seat Angle	Valve Seat Runout (Maximum)	Valve Arrangement (Front to Rear)	Rocker Arm Stud Bore Dia.–Std.	Gasket Surface Flatness (2)
			Intake	Exhaust					
170,200	48.50–50.50 (1)	0.3115–0.3125	0.070–0.080	0.070–0.080	Intake and Exhaust 45°	0.0020	E-I-I-E-I-E-E-I-E-I-I-E	–	0.003 Inch In Any 6 Inches 0.007 Overall
289	52.00–55.00	0.3433–0.3443	0.060–0.080	0.060–0.080		0.0015	Right I-E-I-E-I-E-I-E Left E-I-E-I-E-I-E-I	0.3685–0.3695	
390	71.2–74.2	0.3728–0.3735	0.040–0.060	0.070–0.090		0.0020	Right and Left E-I-E-I-I-E-I-E	–	
427	73.00–76.00	0.3728–0.3735	0060–0.080	0.070–0.090	Intake 30° Exhaust 45°	0.0020	Right and Left E-I-E-I-I-E-I-E	–	

(1) Thermactor 52.0–54.0 (2) Head Gasket Surface Finish R.M.S. All............90–150

CYLINDER BLOCK

Engine	Cylinder Bore Diameter-(Standard Spreads For 8 Grades) (1)	Cylinder Bore Diameter 0.003 O.S.	Tappet Bore Dia.	Main Bearing Bore-Dia.	Cylinder Block Distributor Shaft Bearing Bore Diameter	Head Gasket Surface Flatness (2)
170	3.5000–3.5024	3.5024–3.5036	0.875–0.876	2.4012–2.4020	0.4525–0.4535	Overall 0.003 inch in any 6 inches 0.007 inch
200	3.6800–3.6824	3.6824–3.6836		2.4012–2.4020		
289	4.0004–4.0028	4.0028–4.0040		2.4412–2.4420	0.4525–0.4541	
390	4.0500–4.0524	4.0524–4.0536		2.9412–2.9420	0.4525–0.4535	
427	4.2328–4.2352	4.2352–4.2364				

(1) Maximum out-of-round.......................0.001
Wear limit.............................0.005
Cylinder bore surface finish RMS
All......................................15-35

(2) Head gasket surface finish RMS
All....................90-150

VALVE ROCKER ARMS, ROCKER ARM SHAFT, PUSHRODS AND TAPPETS

Engine	Rocker Arm Shaft O.D.	Rocker Arm To Rocker Shaft Clearance	Rocker Arm Bore Diameter	Rocker Arm Lift Ratio	Valve Push Rod (Maximum Runout)	Valve Tappet or Lifter		
						Standard Diameter	Clearance To Bore (2)	Hydraulic Lifter Leakdown Rate
170,200	0.780–0.781	0.002–0.0045 (1)	0.783–0.784	1.50:1	0.025	0.8740–0.8745	0.0005–0.0020	5–50 Seconds Maximum—Measured at 1/16 inch plunger travel
289	–	–	–	1.60:1	0.015			
390	0.839–0.840	0.0030–0.0055 (1)	0.843–0.844	1.73:1	0.025			
427	0.839–0.840	0.0030–0.0055 (1)	0.843–0.844	1.76:1	0.025			

(1) Wear Limit–0.0060 (2) Wear Limit–0.005

CAMSHAFT

Engine	Lobe Lift (1)		Theoretical Valve Lift		Camshaft End Play		Camshaft Journal To Bearing Clearance	
	Intake	Exhaust	Intake	Exhaust	End Play	Wear Limit	Clearance	Wear Limit
170 Falcon	0.232	0.2320	0.348	0.348	0.001–0.007	0.012	0.001–0.003	0.006
200	0.245	0.2450	0.3675	0.3675	0.001–0.007	0.012		
289 (2)	0.2303	0.2375	0.368	0.381	0.0005–0.0055	0.0070		
289 (3)	0.2663	0.2657	0.4261	0.4251				
289 HP	0.2983	0.2983	0.477	0.477				
390	0.2530	0.2530	0.440	0.440	0.001–0.007	0.012		
390 GT	0.2780	0.2830	0.481	0.490				
427	0.2980	0.2980	0.500	0.500				

(1) Maximum allowable lobe lift loss (all engines) 0.005
(2) Non-Thermactor and early production Thermactor
(3) Late Production Thermactor

CAMSHAFT (CONTINUED)

Item	Bearing	Engine 170,200	Engine 289	Engine 390,427
Camshaft Journal Diameter—Standard ①	(No. 1)	1.8095–1.8105	2.0805–2.0815	2.1238–2.1248
	(No. 2)		2.0655–2.0665	
	(No. 3)		2.0505–2.0515	
	(No. 4)		2.0355–2.0365	
	(No. 5)		2.0205–2.0215	
Camshaft Bearings Inside Diameter	(No. 1)	1.8115–1.8125	2.0825–2.0835	2.1258–2.1268
	(No. 2)		2.0675–2.0685	
	(No. 3)		2.0525–2.0535	
	(No. 4)		2.0375–2.0385	
	(No. 5)		2.0225–2.0235	
Camshaft Bearing Location ②	(No. 1)	0.115–0.125	0.005–0.020	0.005–0.020

① Camshaft journal maximum runout
All engines..........................0.005
Camshaft journal maximum out-of-round
170, 200, 289...........................0.0005
All others............................... 0.0010.

② Distance in inches that the front edge of the bearing is installed towards the rear from the front face of the cylinder block.

CAMSHAFT VALVE TIMING

Engine	Camshaft Identification	Intake Valve Opens	Intake Valve Closes	Exhaust Valve Opens	Exhaust Valve Closes
170 Falcon		0.002 Inch @ 9° BTDC	0.005 Inch @ 51° ABDC	0.002 Inch @ 42° BBDC	0.005 Inch @ 18° ATDC
170 Falcon	① ⑤	0.002 Inch @ 7° BTDC	0.005 Inch @ 53° ABDC	0.002 Inch @ 53° BBDC	0.005 Inch @ 7° ATDC
200	② ⑤	0.002 Inch @ 9° BTDC	0.005 Inch @ 51° ABDC	0.002 Inch @ 42° BBDC	0.005 Inch @ 18° ATDC
200		0.002 Inch @ 7° BTDC	0.005 Inch @ 65° ABDC	0.002 Inch @ 55° BBDC	0.005 Inch @ 21° ATDC
289		0.004 Inch @ 16° BTDC	0.006 Inch @ 70° ABDC	0.002 Inch @ 52° BBDC	0.005 Inch @ 24° ATDC
289	③ ⑥	0.004 Inch @ 15° BTDC	0.006 Inch @ 61° ABDC	0.004 Inch @ 55° BBDC	0.006 Inch @ 19° ATDC
289 HP		0.008 Inch @ 46° BTDC	0.10 Inch @ 84° ABDC	0.008 Inch @ 94° BBDC	0.010 Inch @ 36° ATDC
390 2-V	④ ⑦	0.004 Inch @ 13° BTDC	0.006 Inch @ 63° ABDC	0.004 Inch @ 63° BBDC	0.006 Inch @ 23° ATDC
390		0.004 Inch @ 16° BTDC	0.006 Inch @ 60° ABDC	0.004 Inch @ 55° BBDC	0.006 Inch @ 21° ATDC
390 GT		0.004 Inch @ 18° BTDC	0.006 Inch @ 72° ABDC	0.004 Inch @ 68° BBDC	0.006 Inch @ 22° ATDC
427		0.006 Inch @ 48° BTDC	0.008 Inch @ 96° ABDC	0.006 Inch @ 96° BBDC	0.008 Inch @ 48° ATDC

① Identified by letter "AN" between No. 5 and No. 6 intake lobes.
② Identified by letters "AD" between No. 5 and No. 6 intake lobes.
③ Identified by letters "AY" between rear lobe and rear journal.
④ Identified by letters "AX" between rear lobe and rear journal.
⑤ Imco exhaust emission.
⑥ Thermactor exhaust emission — Late production only.
⑦ Non-exhaust emission.

CAMSHAFT DRIVE MECHANISM

Engine	Camshaft Gear Or Sprocket Face Runout T.I.R. Max.	Camshaft Gear Or Sprocket Assembled Face Runout T.I.R. Max.	Crankshaft Gear Or Sprocket Face Runout T.I.R. Max.	Crankshaft Gear Or Sprocket Assembled Face Runout T.I.R. Max.	Timing Chain Deflection (Maximum)
170,200	0.002		0.003	0.006	0.500
289	0.001	0.006	0.001		
390	0.002				
427	0.002				

VALVES

Engine	Valve Stem To Valve Guide Clearance		Valve Lash (Mechanical Tappets) Intake and Exhaust		Valve Clearance Hydraulic Lifters ④	Valve Head Diameter		Valve Face Angle ⑤	Minimum Allowable Valve Stem Tip Length
	Intake	Exhaust	Cold	Hot		Intake	Exhaust		
170,200	0.0008–0.0025 ①	0.0010–0.0027 ②	0.018	0.018	0.066–0.216	1.642–1.657	1.381–1.396	Intake and Exhaust 44°	–
289 ⑥	0.0010–0.0027 ①	0.0010–0.0027 ①	0.022	0.018	0.067–0.167	1.773–1.783	1.442–1.457		0.312
289 Hi Perf									0.210
390	0.0010–0.0024 ①	0.0010–0.0024 ③	–	–	0.100–0.200	2.022–2.037	1.551–1.566		–
427	0.0010–0.0024 ①	0.0020–0.0034 ③	0.028	0.025	–	2.022–2.037	1.645–1.660	Intake 29° Exhaust 44°	–

① Wear Limit 0.0045 ② Wear Limit 0.0047 ③ Wear Limit 0.0055
④ Clearance specified is obtained at the valve stem tip with the tappet collapsed.
⑤ Valve Face Runout......All Engines.......Maximum 0.0020
⑥ Hydraulic Valve Lifter Adjustment Turns Down After Contact 289 Except H/P–3/4

VALVES (CONTINUED)

Engine	Valve Stem Diameter							
	Standard		0.003 Oversize		0.015 Oversize		0.030 Oversize	
	Intake	Exhaust	Intake	Exhaust	Intake	Exhaust	Intake	Exhaust
170,200	0.3100–0.3107	0.3098–0.3105	0.3130–0.3137	0.3128–0.3135	0.3250–0.3257	0.3248–0.3255	0.3400–0.3407	0.3398–0.3405
289	0.3416–0.3423	0.3416–0.3423	0.3446–0.3453	0.3446–0.3453	0.3566–0.3573	0.3566–0.3573	0.3716–0.3723	0.3716–0.3723
390	0.3711–0.3718	0.3711–0.3718	0.3741–0.3748	0.3741–0.3748	0.3861–0.3868	0.3861–0.3868	0.4011–0.4018	0.4011–0.4018
427	0.3711–0.3718	0.3701–0.3708	0.3741–0.3748	0.3731–0.3738	0.3861–0.3868	0.3851–0.3858	0.4011–0.4018	0.4001–0.4008

VALVE SPRINGS

Engine	Valve Spring Pressure– Lbs. @ Specified Length		Valve Spring Free Length Approximate	Valve Spring Assembled Height Pad To Retainer	Valve Spring Out-Of-Square (Max.)
	Pressure	Wear Limit			
170 Falcon and 200	51–57 @ 1.590 142–158 @ 1.222	46 @ 1.590 128 @ 1.222	1.79	1-9/16–1-39/64	0.078 ALL ENGINES
289 Except H/P ①	71–79 @ 1.66 174–192 @ 1.27	68 @ 1.64 165 @ 1.25	1.93	1-5/8–1-11/16	
289 Except H/P ②	71–79 @ 1.66 171–189 @ 1.23	68 @ 1.66 162 @ 1.23	1.97	1-5/8–1-11/16	
289 (Hi-Perf)	83.5–92.5 @ 1.770 234.5–259.5 @ 1.320	75 @ 1.770 209 @ 1.320	2.04	1-3/4–1-25/32	
390 (Except GT)	85–95 @ 1.820 209–231 @ 1.380	76 @ 1.820 188 @ 1.380	2.12	1-13/16–1-27/32	
390 GT, 427 H.P.	80–90 @ 1.820 255–280 @ 1.320	72 @ 1.820 230 @ 1.320	2.06	1-51/64–1-53/64	

① Non-Thermactor and early Production Thermactor
② Late Production Thermactor

CRANKSHAFT AND FLYWHEEL

Engine	Main Bearing Journal Diameter ②	Main Bearing Journal Runout—Maximum	Main Bearing Journal Thrust Face Runout	Main Bearing Journal Max. Taper	Thrust Bearing Journal Length	Main and Rod Bearing Journal Finish R.M.S. Max.	Main and Rod Bearing Journal Thrust Face Finish R.M.S.
170,200	2.2482–2.2490	0.0025 ①	0.001	0.0003 Per Inch	1.275–1.277	12	35 Front 25 Rear
289	2.2482–2.2490	0.002			1.137–1.139		
390	2.7484–2.7492				1.124–1.126		
427	2.7484–2.7492	Wear Limit 0.003					

① Wear limit 0.0035

② Connecting rod and main bearing journal out-of-round maximum 0.0004 (all engines)

CRANKSHAFT AND FLYWHEEL (CONTINUED)

Engine	Connecting Rod Journal Diameter ③	Connecting Rod Bearing Journal Maximum Taper	Crankshaft Free End Play	Crankshaft To Rear Face Of Block Run-Out T.I.R. Max.	Flywheel Clutch Face Runout	Flywheel O.D. Runout Transmission	
						Stand.	Auto.
170,200	2.1232–2.1240	0.0003 Per Inch	0.004–0.008 ①	0.010	0.007	0.018	0.020
289	2.1228–2.1236	0.0004 Per Inch	0.004–0.008 ①		0.010	0.018	
390,427	2.4380–2.4388	0.0003 Per Inch	0.004–0.010 ②		0.010	0.020	

① Wear limit 0.012 ② Wear limit 0.014

③ Connecting rod and main bearing journal out-of-round maximum 0.0004 (all engines)

CRANKSHAFT BEARINGS

Engine	Connecting Rod Bearings			Main Bearings		
	To Crankshaft Clearance		Wall Thickness	To Crankshaft Clearance		Wall Thickness
	Desired	Allowable	—Standard ④	Desired	Allowable	—Standard ①
170,200	0.0008–0.0015	0.0008–0.0024	0.0571–0.0574	0.0005–0.0015	0.0005–0.0022	0.0758–0.0761
289		0.0008–0.0026	0.0572–0.0577		0.0005–0.0024	0.0957–0.0962
390		0.0008–0.0026	0.0755–0.0760		0.0005–0.0025	0.0956–0.0961
427	0.0013–0.0032	0.0013–0.0032	③	0.0007–0.0031	0.0007–0.0031	②

① 0.002 U.S. thickness
(170, 200, 289)................Add 0.0010 to standard clearance.
(others)...............................0.0966–0.0971

② Coded red 0.0953–0.0958, Coded blue 0.0957–0.0962

③ Coded red 0.0751–0.0756, Coded blue 0.0755–0.0760

④ 0.002 U.S. thickness
(289, 390).....................Add 0.0010 to standard clearance
(170, 200)............................0.0583–0.0588
(427)..................................0.0765–0.0770

CONNECTING ROD

Engine	Piston Pin Bore Or Bushing I.D. ①	Connecting Rod Bearing Bore Diameter Red ②	Connecting Rod Bearing Bore Diameter Blue	Connecting Rod Length Center To Center	Connecting Rod Alignment Maximum Total Difference ③		Connecting Rod Assembly (Assembled To Crankshaft)	
					Twist	Bend	Side Clearance	Wear Limit
170,200	0.9107–0.9112	2.2390–2.2398	—	4.7135–4.7165	0.008	0.004	0.0035–0.0105	0.014
289	0.9104–0.9112	2.2390–2.2398	—	5.1535–5.1565	0.012		0.010–0.020	0.023
390	0.9752–0.9755	2.5907–2.5911	2.5911–2.5915	6.486–6.490			0.010–0.020	0.023
427	0.9754–0.9757	2.5907–2.5911	2.5911–2.5915	6.486–6.490			0.014–0.024	0.027

① Piston pin bushing or bore
Maximum out-of-round
390.....................0.0004
Maximum taper
390, 427..........................0.0003

② Connecting rod bearing bore maximum out-of-round and taper (all engine)............0.0004

③ Pin bushing and crankshaft bearing bore must be parallel and in the same vertical plane within the specified total difference at ends of 8-inch long bar measured 4 inches on each side of rod.

PISTON PIN

Engine	Length	Diameter: Standard	Diameter: 0.001 Oversize	Diameter: 0.002 Oversize	To Piston Clearance	To Connecting Rod Bushing Clearance
170,200	3.010–3.040	0.9119–0.9124	0.9130–0.9133	–	0.0003–0.0005 ① 0.0002–0.0004	②
289						
289 HP						
390	3.156–3.170	0.9750–0.9753	0.9760–0.9763	0.9770–0.9773	0.0001–0.0003 ①	0.0001–0.0005 ③
427	3.202–3.212					0.0003–0.0005 ③

① Wear Limit 0.0008 ② Interference fit ③ Wear Limit 0.0010

PISTON

Engine	Diameter ①: Coded Red	Diameter ①: Coded Blue	0.003 Oversize	Piston To Cylinder Bore Clearance	Piston Pin Bore Diameter	Ring Groove Width
170	3.4982–3.4987	3.4993–3.4999	3.5001–3.5005	0.0014–0.0020	0.9122–0.9125	Upper Compression Ring (all engines) 0.080–0.081
200	3.6778–3.6784	3.6790–3.6796	3.6802–3.6808	0.0014–0.0020	0.9122–0.9125	
289	3.9984–3.9990	3.9996–4.0002	4.0008–4.0014	0.0018–0.0026	0.9123–0.9126	Lower Compression Ring (all engines except 427) 0.080–0.081 (427) 0.096–0.097
289 HP	3.9978–3.9984	3.9990–3.9996	4.0002–4.0008	0.0030–0.0038	0.9123–0.9126	
390	4.0484–4.0490	4.0496–4.0502	4.0508–4.0514	0.0015–0.0023	0.9752–0.9755	Oil Ring (all engines) 0.1880–0.1890
427	4.2284–4.2290	4.2296–4.2302	4.2308–4.2314	0.0042–0.0066	0.9752–0.9755	

① Measured at the piston pin bore centerline at 90° to the pin bore.

PISTON RINGS

Engine	Ring Width: Compression Ring: Top	Ring Width: Compression Ring: Bottom	Side Clearance: Compression Ring ①: Top	Side Clearance: Compression Ring ①: Bottom	Oil Ring	Ring Gap Width: Compression Ring: Top	Ring Gap Width: Compression Ring: Bottom	Ring Gap Width: Oil ② Ring
170	0.0774–0.0781	0.0770–0.0780	0.0019–0.0036	0.0020–0.0040	Snug	0.010–0.020	0.010–0.020	0.015–0.055
200								
289								0.015–0.066
390	0.0770–0.0781		0.0020–0.0040			0.010–0.031		
427	0.0774–0.0781	0.0930–0.0940	0.0024–0.0041			0.010–0.031		0.015–0.066

① Wear limit (all engines) 0.0060 ② Steel Rail

WATER PUMP

Engine And Vehicle	Water Pump Pulley To Engine Ratio	Water Pump Assembly Dimensions: Front Face Of Pulley Hub To Pump Housing Face	Water Pump Assembly Dimensions: Impeller To Housing Mounting Surface Clearance	Water Pump Drive Arrangement
170 All	1.04:1	3.94	0.011–0.045	Water pump, fan and alternator belt driven from crankshaft damper.
200 All	1.18:1	3.94	0.011–0.045	
289 Non-Thermactor	1.04:1	5.420	0.030–0.050	
289 Thermactor	1.13:1	5.420	0.030–0.050	
427	0.94:1	7.569	0.070–0.080	
390 Fairlane, Mercury Intermediate	0.90:1	7.569	0.070–0.080	
390 Mustang, Cougar, 428 Police	1.06:1	7.569	0.070–0.080	

OIL PUMP

Engine	Rotor-Type Oil Pump Relief Valve Spring Tension Lbs @ Specified Length	Drive Shaft To Housing Bearing Clearance	Relief Valve Clearance	Rotor Assembly End Clearance	Outer Race To Housing (Radial Clearance)
170, 200	9.0–10.1 @ 1.078	0.0015–0.0029	0.0015–0.0029	0.0011–0.0041	0.006–0.012
289	11.15–11.75 @ 1.704				
390	8.7–9.5 @ 1.56				
427	8.0–13.0 @ 1.56				

APPROXIMATE OIL PAN CAPACITIES ①

Engine	U.S. Measure	Imperial Measure	Engine	U.S. Measure	Imperial Measure
170 Falcon	4-1/2 quarts	3-1/2 quarts	390	5 quarts	4 quarts
200	4-1/2 quarts	3-1/2 quarts	427	6 quarts	5 quarts
289 Except Bronco	5 quarts	4 quarts			

① Includes one quart required with filter replacement.

TORQUE LIMITS

Engine	Cylinder Head Bolts Step 1	Cylinder Head Bolts Step 2	Cylinder Head Bolts Step 3	Oil Pan To Cylinder Block	Manifolds To Cylinder Head Intake	Manifolds To Cylinder Head Exhaust	Water Outlet Housing	Flywheel To Crankshaft
170,200	55	65	70–75	7–9	–	13–18	12–15	75–85
289	50	60	65–72	9–11 (5/16–18) ①	20–22	15–20		
390	70	80	80–90	9–11	32–35	12–18 ②		
427	90	100	100–110	9–11	32–35	12–18		

① 7–9 (1/4–20) ② Fairlane, Mercury Intermediate, Mustang 15–20

TORQUE LIMITS (CONTINUED)

Engine	Main Bearing Cap Bolts ①	Oil Pan Drain Plug	Oil Pump To Cylinder Block	Oil Pump Cover Plate	Oil Filter Adapter To Cylinder Block	Oil Filter To Adapter Or Cylinder Block	Cylinder Front Cover
170, 200	60–70	15–20	12–15	6–9	10–15	With grease on the gasket surface, hand-tighten until gasket contacts adapter face, then tighten 1/2 turn more.	7–9
289			23–28	9–12	60–100		12–15
390	95–105		20–25	6–9	12–15		
427							

① 427 Main Bearing Cross Bolts, Step 1 is 20, Step 2 is 40

TORQUE LIMITS (CONTINUED)

Engine	Water Pump To Cylinder Block Or Front Cover	Camshaft Sprocket To Camshaft	Camshaft Thrust Plate In Block	Damper Or Pulley To Crankshaft	Connecting Rod Nuts	Water Rocker Arm Cover
170,200	12–15	35–45	12–15	85–100	19–24	3–5
289	12–15	40–45	6–9	70–90	19–24	3–5
289 HP	12–15	40–45	6–9	70–90	40–45	3–5
390,427	20–25	35–45	12–15	70–90	①	4–7

① 390, 40–45, 427, 53–58

TORQUE LIMITS (CONTINUED)

<table>
<tr><th>Engine</th><th>Oil Inlet Tube To Oil Pump</th><th>Fuel Pump To Cylinder Block Or Cylinder Front Cover</th><th>Air Manifold To Cylinder Head–Thermactor</th><th>Thermal Sensing Unit</th><th>Check Valve To Air Manifold Or Supply Tube–Thermactor</th><th>Adjusting Arm To Air Pump–Thermactor</th></tr>
<tr><td>170,200</td><td rowspan="4">12–15</td><td>12–15</td><td>5–7</td><td rowspan="4">23–30</td><td rowspan="4">16–19 ①</td><td rowspan="4">15–20 ①</td></tr>
<tr><td>289</td><td rowspan="3">20–25</td><td>–</td></tr>
<tr><td>289 HP</td><td>–</td></tr>
<tr><td>390,427</td><td>5–7 ①</td></tr>
</table>

① Except 427.

TORQUE LIMITS (CONTINUED)

Engine	Valve Rocker Shaft Support To Cylinder Head	Valve Rocker Arm Stud To Cylinder Head
170, 200	30–35	–
289	–	60–70
390, 427	40–45	–

Valve Rocker Arm Adjusting Nut
(With Tappet on Camshaft Base Circle Turn Adjusting Nut Counterclockwise)
289 .... 4.5–15 Ft-Lbs

Self-Locking Valve Rocker Arm Adjusting Screw
(Minimum Torque Required to Rotate)
170 .... 7 Ft-Lbs
427 .... 3 Ft-Lbs

ENGINE SUPPORT TORQUE LIMITS

Supports		Mustang–Cougar 200	Mustang–Cougar 289	Mustang–Cougar 289 HP	Mustang–Cougar 390	Mercury Intermediate–Falcon-Fairlane 170	Mercury Intermediate–Falcon-Fairlane 200	Mercury Intermediate–Falcon-Fairlane 289	Mercury Intermediate–Falcon-Fairlane 390
Engine Front Support									
Insulator to Engine		18–24	25–40	25–40	–	–	–	35–50	35–50
Insulator to Body or Intermediate Bracket		25–35	35–50	25–40	35–50	24–34	24–34	35–50	45–60
Body Bracket to Body		20–30	20–30	20–28	20–30	20–30	20–30	20–30	20–30
Body Bracket to Intermediate Support Bracket		–	20–30	26–35	20–30	–	–	–	45–60
Engine Bracket to Engine		–	–	35–50	35–50	18–25	18–25	–	–
Insulator to Insulator Bracket and Support Bracket		–	–	35–50	–	–	–	–	–
Insulator to Engine Bracket		–	–	–	45–60	18–25	18–25	–	–
Engine Rear Support									
Insulator to Rear Support		25–35	25–35	25–35	25–35	25–35	25–35	25–35	25–35
Rear Support to Body	Auto. Trans.	10–20	30–42	10–20	10–20	50–70	50–70	50–70	50–70
or Frame	Stand. Trans.	15–20	20–30	10–20	10–20	50–70	50–70	50–70	50–70
Rear Support Extension to Trans.		20–30	–	–	–	–	–	–	–
Insulator to Trans. or Extension		20–30	30–42	20–30	30–42	①	30–60	30–60	30–42

① 15–25 for std. trans., 30–60 for auto. trans.

TORQUE LIMITS FOR VARIOUS SIZE BOLTS

Caution: If any of the torque limits listed in this table disagree with any of those listed in the preceding tables, the limits listed in the preceding tables prevail.

Size (Inches)	1/4–20	1/4–28	5/16–18	5/16–24	3/8–16	3/8–24
Torque (Ft-Lbs)	6–9	6–9	12–15	15–18	23–28	30–35
Size (Inches)	7/16–14	7/16–20	1/2–13	1/2–20	9/16–18	5/8–18
Torque (Ft-Lbs)	45–50	50–60	60–70	70–80	85–95	130–145

THERMACTOR EXHAUST EMISSION SYSTEM TORQUE LIMITS

Check Valve to Air Manifold	16–19
Air Pump Mounting Bolts	23–28

SPECIAL TOOLS

Description	Ford Tool No.	Former No.	Application In Engine Size 170-200 Six	289 V-8	390 V-8
Impact Hammer	T50T-100-A	–	X	X	X
Puller Attachment Use with T50T-100-A or T59L-100-B	T58L-101-A	–	X	X	X
Handle Adapter	T53L-200-A	–	X	X	X
Engine Lifting Sling	T53L-300-A	6000-BA	X	X	X
Differential Backlash and Runout Gauge, with Universal Bracket and Dial Indicator (1 1/4 inch range). Includes Indicator TOOL-6565	TOOL-4201-C	4201-C	X	X	X
Engine Lifting Bracket Use with T53L-300-A	T58P-6000-A	6000-BD			X
Adapter Mount To fit K. R. Wilson 1009 or Manzel 6001-TES	T64L-6001-B	–		X	X
Cylinder Front Cover Pilot	T61P-6019-B	6059-F	X	X	X
Valve Guide Reamer Kit	T58P-6085-B	–			X
Valve Guide Reamer Kit	T60K-6085-B	–		X	
Engine Lifting and Head Holding Brackets	T62F-6085-A	6005-BDA		X	
Piston Pin Remover	T52P-6135-DAD	–			X
Piston Pin Remover and Replacer Press	T65L-6135-C	6135-J		X	
Camshaft Bearings Remover and Replacer Adapters	T65L-6250-A	T52L-6261-CEE	X	X	X
Camshaft Bearing Bore Plug Replacer-Adapter Use with T53L-208-A	T58P-6266-A	–			X
Camshaft Rear Bearing Bore Plug Replacer-Adapter Use with T53L-200-A	T62F-6266-A	–		X	
Crankshaft Damper Replacer	T64T-6306-A	–	X	X	X
Crankshaft Damper Remover	T58P-6316-B	–			X
Crankshaft Damper Remover Adapter Screw Use with T58P-6316-B	T62F-6316-C			X	
Upper Main Bearing Insert Remover and Replacer	TOOL-6331	6331		X	
Upper Main Bearing Remover and Replacer	TOOL-6331-E	6331-E			X
Solid Tappet Remover	T52T-6500-DJD	6500-D		X ①	
Hydraulic Tappet Clip Replacer	TOOL-6500-C	6500-C	X	X	X
Hydraulic Tappet Leakdown Tester	TOOL-6500-E	6500-E	X	X	X
Hydraulic Tappet Plunger Remover and Replacer	TOOL-6500-F	6500-F	X	X	X
Valve Stem Clearance Checking Tool	TOOL-6505-F	6505-F			X
Valve Stem Clearance Checking Tool	TOOL-6505-G	6505-G	X	X	
Valve Face Runout Gauge	T64L-6507-A	–	X	X	X
Valve Spring Compressor	T65P-6513-A	–	X ②		
Air Adapter and Hose-Valve Holdup	TOOL-6513-ABA	6513-AB	X	X	X
Compressor–Tappet Bleed-Down	TOOL-6513-AC	6513-AC	X	X	
Valve and Clutch Spring Tester	TOOL-6513-DD	6513-DD	X	X	X
Valve Spring and Rocker Arm Compressor	TOOL-6513-J	6513-J			X
Push Rod Check Compressor	TOOL-6513-K	6513-K	X		
Rocker Arm Stud Kit	T62F-6A527-B	–	X	X	X

① High Performance Only
② 200 Six Only

SPECIAL TOOLS (CONTINUED)

Description	Ford Tool No.	Former No.	Application In Engine Size 170-200 Six	289 V-8	390 V-8
Rocker Arm Stud Installer (Supplements T56F-6A527-B)	T65P-6A527-A			X	
Cam Lift and Push Rod Stroke Dial Indicator (1 inch range) Use with bracket from TOOL-4201-C	TOOL-6565	6565	X	X	X
Cup Shaped Adapter to TOOL-6565	TOOL-6565-AB	6565-AB	X	X	X
Valve Spring Compressor	T62F-6565-A	6513-HH		X	
Crankcase Ventilation System Tester (Kit)		AC spark plug	X	X	X
Cylinder Block Front Cover Oil Seal Replacer Adapter	T60K-6700-A	6700-C	X		
Cylinder Block Front Cover Oil Seal Replacer Adapter Use with T53L-200-A	T58P-6700-B	6700-B	X	X	X
Crankshaft Rear Oil Seal Forming Tool	T58P-6701-C	6701-C			X
Crankshaft Rear Seal Replacer	T62F-6701-A	6701-E	X	X	
Clutch Disc Pilot	T58P-7563-A	–		X	
Clutch Disc Alignment Pilot	TOOL-7563-E	7563-E	X		
Clutch Pilot Bearing Replacer	TOOL-7600-H	7600-H	X	X	X
THERMACTOR AIR PUMP					
Rotor Ring Bearing Remover and Installer		T66L-9A486-AA			
Rotor Ring Support		T66L-9A486-AB			
Relief Valve Installer		T66L-9A486-B			
Vane Assembly Pin		T66L-9A486-C			
Relief Valve Remover (Use With T59L-100-B)		T66L-9A486-D			
Handle Adapter (Use With T66P-9A486-B)	T62L-201-A				
Slide Hammer	T59L-100-B				
Belt Tension Gauge	T63L-8620-A				
Crowfoot Wrench–1 1/4 inch (Check Valve Removal)	Commercial Tool				

THERMACTOR DRIVE BELT TENSION

New	110-140 Lbs.
Used	80-110 Lbs.

LUBRICANTS

	Ford Part No.
Exhaust Control Valve Lubricant	COAZ-19A501-A, R-149-A
Thermactor Air Pump Bearings	C6AZ-19590-B

SEALERS

	Ford Part No.
Loctite (thread locking compound)	C3AZ-19554-A

Ignition System

GROUP 9

PART 9-1—*General Ignition Service*

This part covers ignition system description and operation, general ignition system diagnosis, tests, adjustments and repair operations. In addition, the cleaning and inspection procedures are covered.

For distributor removal, disassembly, assembly, installation, major repair procedures and specifications, refer to the pertinent part of this group.

The distributor identification number is stamped on the distributor housing. The basic part number for ungoverned distributors is 12127. To procure replacement parts, it is necessary to know the part No. prefix and suffix and, in some cases, the design code change (Fig. 1).

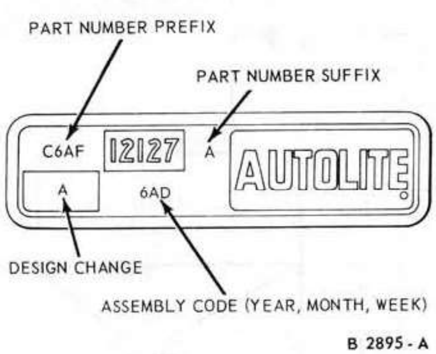

FIG. 1— Distributor Identification

Always refer to the Master Parts Catalog for parts usage and interchangeability before replacing a distributor or a component part for a distributor.

1 DIAGNOSIS AND TESTING

GENERAL INFORMATION

CONVENTIONAL IGNITION SYSTEM

The ignition system consists of a primary (low voltage) and a secondary (high voltage) circuit (Fig. 2).

The primary circuit consists of the:

1. Battery.
2. Ignition switch.
3. Primary circuit resistance wire.
4. Primary windings of the ignition coil.
5. Breaker points.
6. Condenser.

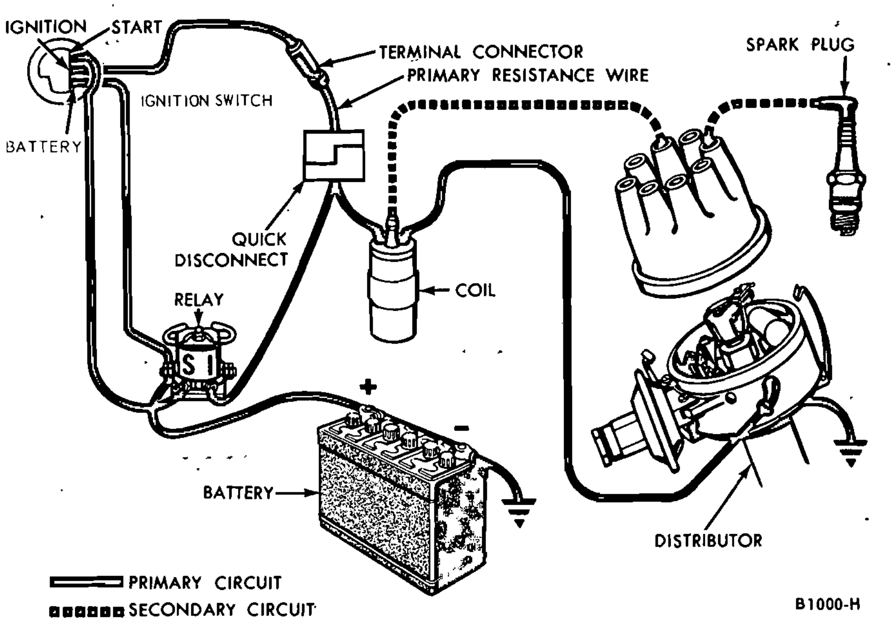

FIG. 2—Typical Conventional Ignition System Circuit

The secondary circuit consists of the:

1. Secondary windings of the ignition coil.
2. Distributor rotor.
3. Distributor cap.
4. High tension wires.
5. Spark plugs.

When the breaker points are closed, the primary or low voltage current flows from the battery through the ignition switch to the primary windings in the coil, then to ground through the closed breaker points. When the breaker points open, the magnetic field built up in the primary windings of the coil moves through the secondary windings of the coil producing high voltage current. **High voltage current is produced each time the breaker points open.** The high voltage flows through the coil high tension lead to the distributor cap where the rotor distributes it to one of the spark plug terminals in the distributor cap. This process is repeated for every power stroke of the engine.

TRANSISTOR IGNITION SYSTEM

The permatuned transistor ignition system is standard on 427 engines. Fig. 3 shows a schematic of the transistor ignition system.

The ignition coil primary in the transistor system is designed to draw 12 amperes peak current, or approximately 5.5 amperes average current as indicated on a conventional ammeter, in order to provide high spark plug voltage at the higher engine speeds.

The transistor in the system acts as a heavy duty switch or relay. It is similar in action to a horn relay, except that it has no moving parts, and thus acts with very little time lag. The transistor is connected between the battery and the coil, and is used to make and break the coil primary circuit.

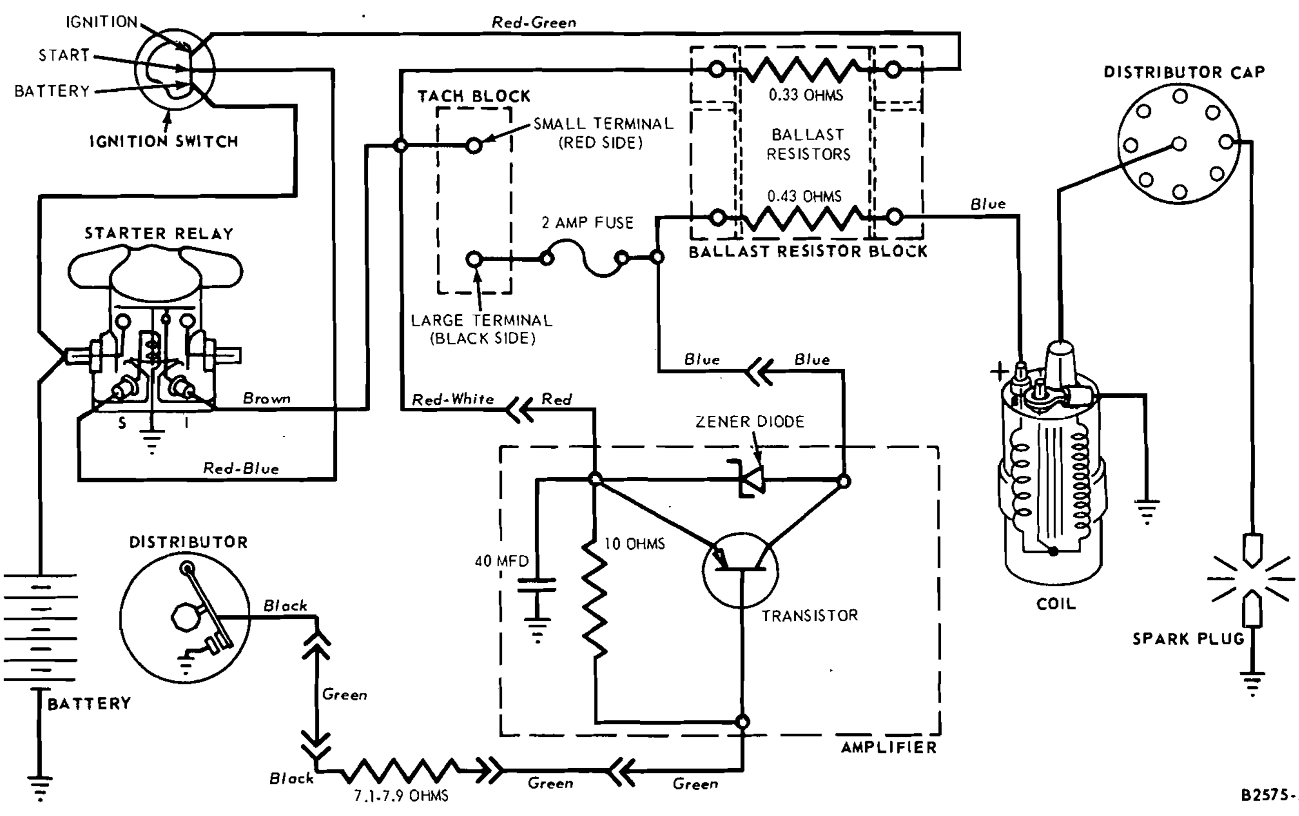

FIG. 3—Typical Transistor Ignition System Circuit

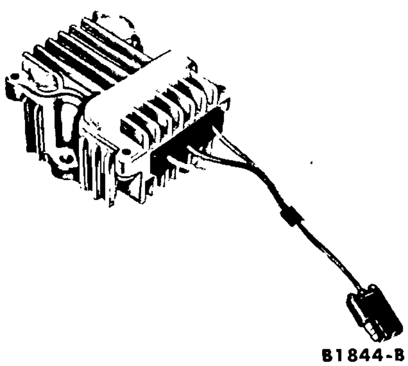

FIG. 4—Amplifier Assembly

The distributor controls the transistor. The 7.1-7.9-ohm resistor, connected between the distributor and the transistor (in the wiring harness), limits the transistor control current (and distributor point current) to 0.5 ampere. The low distributor point current eliminates pitting and gives long distributor point life.

The amplifier assembly (Fig. 4) is mounted under the instrument panel to protect the parts from engine heat.

A ceramic ballast resistor block and a tachometer connector block are mounted in the engine compartment.

A 2-ampere fuse between the black (large) terminal of the tach block and the coil primary circuit prevents the transistor from being damaged by the application of external devices other than normal testing equipment.

The tachometer block is used to connect a tachometer or dwell meter into the circuit. **Do not connect a tachometer or dwell meter into the circuit in any other manner, or readings will be inaccurate and damage may occur to the transistor, or change its operating characteristics.**

Connect the tachometer red lead to the tachometer block red (small) terminal and black lead to the black (large) terminal.

IGNITION SYSTEM TESTS—CONVENTIONAL TEST EQUIPMENT

CONVENTIONAL IGNITION SYSTEM

Trouble Isolation

Ignition system troubles are caused by a failure in the primary and/or the secondary circuit or incorrect ignition timing. If an engine trouble has been traced to the ignition system from the Engine Trouble Diagnosis Guide, the trouble can be found by performing an ignition system test on a scope or by further isolating the trouble to the primary or secondary circuit as follows:

1. Disconnect the brown wire from the starter relay I terminal and the red and blue wire from the starter relay S terminal.
2. Remove the coil high tension lead from the distributor cap.
3. Turn on the ignition switch.
4. While holding the high tension lead approximately 3/16 inch from the cylinder head or any other good ground, crank the engine by using an auxiliary starter switch between the starter relay battery and S terminals.

If the spark is good, the trouble lies in the secondary circuit.

If there is no spark or a weak spark, the trouble is in the primary circuit, coil to distributor high tension lead, or the coil.

Primary Circuit. A breakdown or energy loss in the primary circuit can be caused by:

1. Defective primary wiring, or loose or corroded terminals.
2. Burned, shorted, sticking or improperly adjusted breaker points.
3. A defective coil.
4. A defective condenser.

To isolate a trouble in the primary circuit, proceed as follows:

Turn the ignition switch off and remove the auxiliary starter switch from the starter relay.

Install the coil high tension lead in the distributor cap, the red and blue wire on the starter relay S terminal and the brown wire on the starter relay I terminal.

Now perform a primary circuit test.

Secondary Circuit. A breakdown or energy loss in the secondary circuit can be caused by:

1. Fouled or improperly adjusted spark plugs.
2. Defective high tension wiring.
3. High tension leakage across the coil, distributor cap or rotor resulting from an accumulation of dirt.

To isolate a trouble in the secondary circuit, proceed as follows:

Turn the ignition switch off and remove the auxiliary starter switch

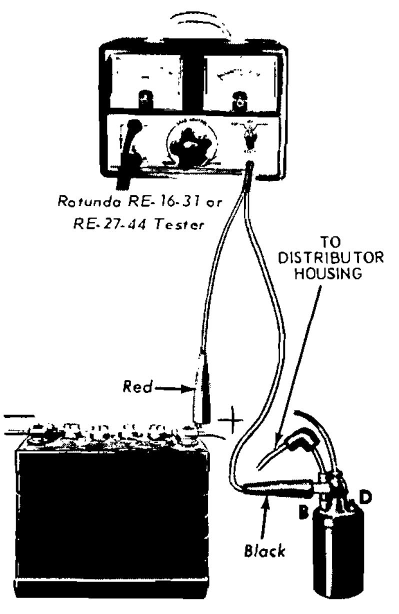

FIG. 5—Battery to Coil and Starting Ignition Circuit Test

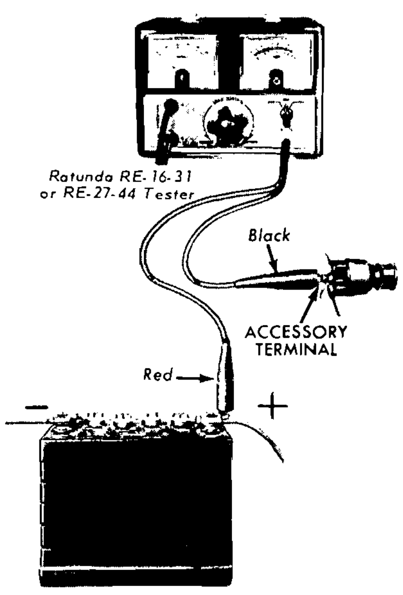

FIG. 6—Ignition Switch Test

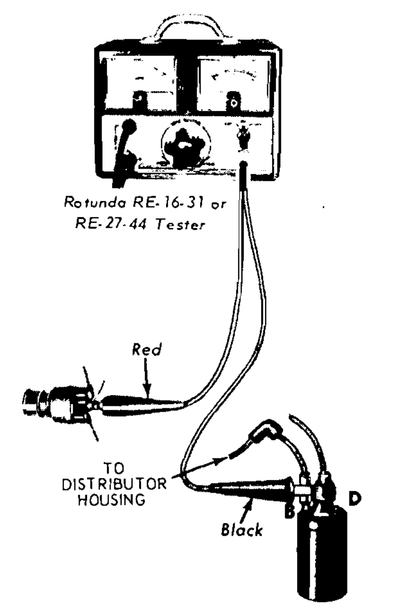

FIG. 7—Resistance Wire Test

from the starter relay.

Install the coil high tension lead in the distributor cap, the red and blue wire on the starter relay S terminal and the brown wire on the starter relay I terminal.

Now perform a secondary circuit test.

Primary Circuit Tests

A complete test of the primary circuit consists of checking the circuit from the battery to the coil, the circuit from the coil to ground, and the starting ignition circuit.

Excessive voltage drop in the primary circuit will reduce the secondary output of the ignition coil, resulting in hard starting and poor performance.

Battery to Coil Test

1. Connect the voltmeter leads as shown in Fig. 5.

2. Install a jumper wire from the distributor terminal of the coil to a good ground on the distributor housing.

3. Turn the lights and accessories off.

4. Turn the ignition switch on.

5. If the voltmeter reading is between 4.5 and 6.9 volts, the primary circuit from the battery to the coil is satisfactory.

6. If the voltmeter reading is greater than 6.9 volts, check the following:

The battery and cables for loose connections or corrosion.

The primary wiring for worn insulation, broken strands, and loose or corroded terminals.

The resistance wire for defects.

The starter relay to ignition switch for defects.

If the voltmeter reading is less than 4.5 volts the resistance wire should be replaced.

Starting Ignition Circuit Test

1. Connect the voltmeter leads as shown in Fig. 5.

2. Disconnect and ground the coil to distributor high tension lead at the distributor.

3. With the ignition switch off, crank the engine by installing a jumper wire between the battery and the S terminal of the starter relay while observing the voltage drop.

4. If the voltage drop is 0.1 volt or less, the starting ignition circuit is satisfactory.

5. If the voltage drop is greater than 0.1 volt, clean and tighten the terminals in the circuit or replace the wiring as necessary.

Ignition Switch Test

1. Connect the voltmeter leads as shown in Fig. 6.

2. Install a jumper wire from the distributor terminal of the coil to a good ground on the distributor body.

3. Turn all of the accessories and lights off.

4. Turn the ignition switch on.

5. If the voltmeter reading is 0.3 volt or less, the ignition switch and the relay to switch wire are satisfactory.

6. If the voltmeter reading is greater than 0.3 volt, either the ignition switch and/or the wire are defective.

Resistance Wire Test

1. Connect the voltmeter leads as shown in Fig. 7.

2. Install a jumper wire from the distributor terminal of the coil to a good ground on the distributor housing.

3. Turn all of the accessories and lights off.

4. Turn the ignition switch on.

5. If the voltmeter reading is between 6.6 and 4.5 volts the resistance wire is satisfactory.

6. If the voltmeter reading is greater thant 6.6 volts, or less than 4.5 replace the resistance wire.

7. Turn the ignition switch off. Disconnect the voltmeter leads. Remove the jumper wire connected to the coil DIST terminal and the distributor. Remove the jumper wire connected to the coil BAT terminal and the coil BAT lead. Connect the BAT lead to the BAT terminal and go on to the Coil to Ground Test.

Coil To Ground Test

1. Connect the voltmeter leads as shown in Fig. 8.

2. Close the breaker points.

3. Turn all lights and accessories off.

4. Turn the ignition switch on.

5. If the voltmeter reading is 0.1 volt or less, the primary circuit from coil to ground is satisfactory.

6. If the voltmeter reading is greater than 0.1 volt, test the voltage drop between each of the following:

The coil and the breaker point connections of the coil to distributor primary wire.

The movable breaker point and the breaker plate.

The breaker plate and the distributor housing.

The distributor housing and engine ground.

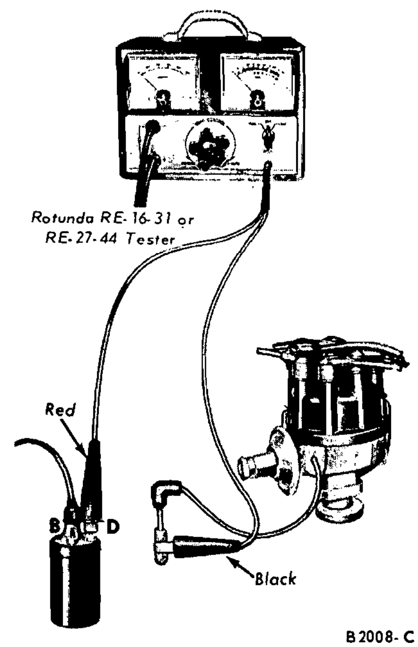

FIG. 8—Coil to Ground Test

7. Turn the ignition switch off. Disconnect the voltmeter leads. Remove the jumper wire connected to the coil DIST terminal and the distributor primary wire. Connect the distributor primary wire to the DIST terminal of the coil.

Breaker Points. Clean and inspect the breaker points by following the procedure under Cleaning and Inspection (Section 3 of this part).

The breaker point dwell can be checked with a distributor tester or a dwell meter by following the procedure under Distributor Tests in this section of the manual.

The breaker point resistance can be checked with a Rotunda ARE-1416 distributor tester by following the procedure under Distributor Tests in this section of the manual.

Coil. Clean and inspect the coil by following the procedure under Cleaning and Inspection (Section 3 of this part).

Check the coil on a coil tester by following the manufacturers instructions.

Secondary Circuit Tests

Distributor Cap. Clean and inspect the distributor cap by following the procedure under Cleaning and Inspection (Section 3 of this part).

Rotor. Clean and inspect the rotor by following the procedure under Cleaning and Inspection (Section 3 of this part).

Secondary (High Tension) Wires. The secondary wires include the wires connecting the distributor cap to the spark plugs and the wire con-

necting the center terminal of the distributor cap to the center terminal of the ignition coil.

Clean and inspect the secondary wiring by following the procedure under Cleaning and Inspection (Section 3 of this part).

These wires are the radio resistance-type which filter out the high frequency electrical impulses that are the source of ignition noise interference. The resistance of each wire should not exceed 1000, ohms per inch. **When checking the resistance of the wires or setting ignition timing, do not puncture the wires with a probe. The probe may cause a separation in the conductor.**

When removing the wires from the spark plugs grasp and twist the moulded cap, then pull the cap off the spark plug. Do not pull on the wire because the wire connection inside the cap may become separated or the insulator may be damaged.

To check the spark intensity at the spark plugs, proceed as follows:

1. Disconnect a spark plug wire. **Check the spark intensity of one wire at a time.**

2. Install a terminal adapter in the terminal of the wire to be checked. Hold the adapter approximately 3/16-inch from the exhaust manifold and crank the engine, using a remote starter switch. The spark should jump the gap regularly.

3. If the spark intensity of all the wires is satisfactory, the coil, condenser, rotor, distributor cap and the secondary wires are probably satisfactory.

If the spark is good at only some wires, check the resistance of the faulty leads.

If the spark is equal at all wires, but weak or intermittent, check the coil, distributor cap and the coil to distributor high tension wire.

Spark Plugs. Inspect, clean and gap the plugs following the insturctions in Sections 2 and 3. After the proper gap is obtained, check the plugs on a testing machine. Compare the sparking efficiency of the cleaned and gapped plug with anew plug. Replace the plug if it fails to meet 70% of the new plug performance.

Test the plugs for compression leakage at the insulator seal. Apply a coating of oil to the shoulder of the plug where the insulator projects through the shell, and to the top of the plug, where the center electrode and terminal project from the insulator. Place the spark plug under pressure with the tester's high tension wire removed from the spark plug. Leakage is indicated by air bubbling through the oil. If the test indicates compression leakage, replace the plug. If the plug is satisfactory, wipe it clean.

Ignition Timing. Incorrect ignition timing can be caused by:

1. Timing incorrectly adjusted.

2. Distributor bushing and/or shaft worn, or a bent distributor shaft.

3. Defective vacuum advance system.

4. Defective centrifugal advance system.

TRANSISTOR IGNITION SYSTEM

Do not use any other testing procedures or conventional short-cuts

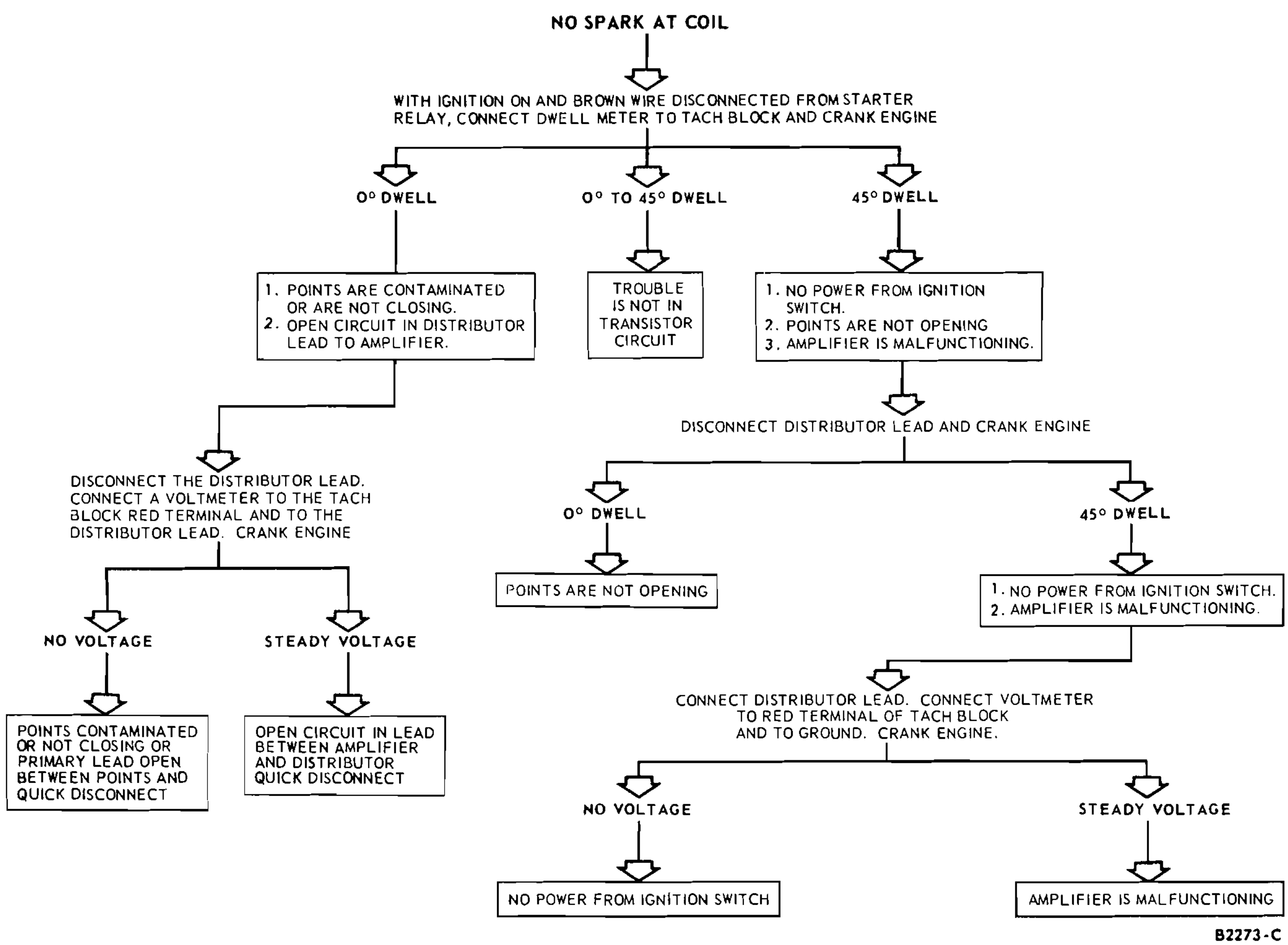

FIG. 9—Transistor Ignition System Test Procedures

than those listed below, or extensive damage can result to the system.

Trouble Isolation

Ignition troubles are caused by a failure in the primary or secondary circuit, or incorrect ignition timing. Isolate the trouble as follows:

1. Remove the coil high tension lead from the distributor cap.

2. Disconnect the brown wire from the starter relay I terminal and the red and blue wire from the starter relay S terminal.

3. Turn the ignition switch on.

4. While holding the high tension lead approximately 1/4 inch from a good engine ground, crank the engine by using an auxiliary starter switch between the starter relay battery and S terminals.

If the spark is good, the trouble lies in the secondary (high voltage) circuit. If there is no spark or a weak spark, the trouble is in the primary (low voltage) circuit.

Primary Circuit. A breakdown or energy loss in the primary circuit can be caused by:

1. Defective primary wiring.

2. Improperly adjusted, contaminated or defective distributor points.

3. Defective amplifier assembly.

The trouble can be isolated by performing a primary circuit test.

Secondary Circuit. A breakdown or energy loss in the secondary circuit can be caused by:

1. Fouled or improperly adjusted spark plugs.

2. Defective high voltage wiring.

3. High voltage leakage across the coil distributor cap or rotor.

To isolate a trouble in the secondary circuit, turn the ignition switch off, remove the auxiliary starter switch from the starter relay, install the coil high tension lead in the distributor cap, the red and blue wire to the starter relay (this goes on the S terminal) and the brown wire to the starter relay (this goes on the I terminal) and perform a secondary circuit test.

Primary Circuit Tests

When diagnosis procedures isolate trouble to the primary circuit, make the following tests to locate the defective item. **Do not use any other procedure, conventional short-cut, or connect test equipment in any other manner than that described, or extensive damage can be caused to the transistor ignition system.** Fig. 9 shows the transistor ignition system tests in outline form.

Connect a dwell meter to the tachometer block. Connect the black lead to the black (large) terminal and the red lead to the red (small) terminal.

With the auxiliary starter switch installed and the ignition switch on as in the trouble isolation procedures, ground the coil high tension wire and crank the engine with the auxiliary starter and observe the dwell reading.

0° Dwell. A dwell reading of 0° indicates:

1. The distributor points are contaminated or are not closing.

2. An open circuit in the distributor lead to the amplifier.

To determine which item listed is causing the trouble, proceed as follows:

Disconnect the distributor lead at the bullet connector and connect a voltmeter red lead to the red (small) tach block terminal and the voltmeter black lead to the distributor lead from the distributor. **Do not connect the voltmeter to the lead from the amplifier.** Crank the engine and note the voltmeter reading.

If a steady indication of voltage is obtained, the trouble is in the distributor lead to the amplifier. Absence of any voltage indication on the voltmeter shows that there is an open circuit between the distributor lead and the breaker point ground.

0° to 45° Dwell. A dwell reading between 0° and 45° indicates:

1. The transistor and the primary circuit are functioning properly.

2. The trouble could be in the secondary circuit.

45° Dwell. A dwell reading of 45° indicates:

1. No power from the ignition switch.

2. The distributor points are closed and not opening.

3. Defective amplifier assembly.

To determine which of the three items listed is causing the trouble, proceed as follows:

Disconnect the distributor lead at the bullet connector, and crank the engine. If the dwell meter indicates 0° dwell, the distributor points are not opening. If 45° dwell is indicated, the amplifier is malfunctioning or there is no power from the ignition switch.

Use a voltmeter or test light to determine if the transistor (amplifier assembly) is at fault. Connect the voltmeter to the red-green lead terminal of the ballast resistor and to ground. Crank the engine.

Absence of any voltage indication on the voltmeter shows there is an open circuit, or no power between the ignition switch and the amplifier. The ballast resistor could be defective. Replace it with a known good ballast resistor, and repeat the test.

A steady indication of voltage on the voltmeter indicates either a defective amplifier or the coil to amplifier lead is defective or improperly connected to the ballast resistor. Proceed as follows:

1. Disconnect the amplifier at the quick disconnect.

2. Connect an ohmmeter across the outside terminals of the amplifier side of the quick disconnect.

3. Reverse the ohmmeter leads.

If a very high resistance is obtained one way and a very low or zero resistance is obtained the other way, the amplifier is not defective. Check the coil to amplifier wiring for a loose connection or defective wiring.

After a repair has been made, run through the test again to check for any other malfunctions.

Secondary Circuit Tests

Refer to the conventional ignition system secondary circuit tests for the proper procedure.

IGNITION SYSTEM TESTS—ROTUNDA OSCILLOSCOPE TESTERS

The following is a complete step-by-step procedure for connecting the scope, checking the ignition system primary and secondary circuits and checking the engine dynamic compression (ARE-881 only).

The primary and secondary superimposed pattern checks can be performed with the engine cranking. This allows the dwell, coil and condenser to be checked if the engine will not start.

TEST CONNECTIONS—ARE-27-55, AND ARE-881

The test connections for the ARE-27-55 tester are shown in Fig. 10 and the test connections for the ARE-881 tester are shown in Fig. 11.

1. With the tester turned off, plug the power plug into a proper AC outlet.

2. Disconnect the distributor primary wire at the coil. Connect a jumper wire to the coil DIST terminal and the distributor primary wire. Connect the green lead to the jumper wire.

3. Remove the No. 1 plug wire from the distributor cap; place the blue pickup in the cap, and place the plug wire in the pickup.

4. On the ARE-27-55 tester, con-

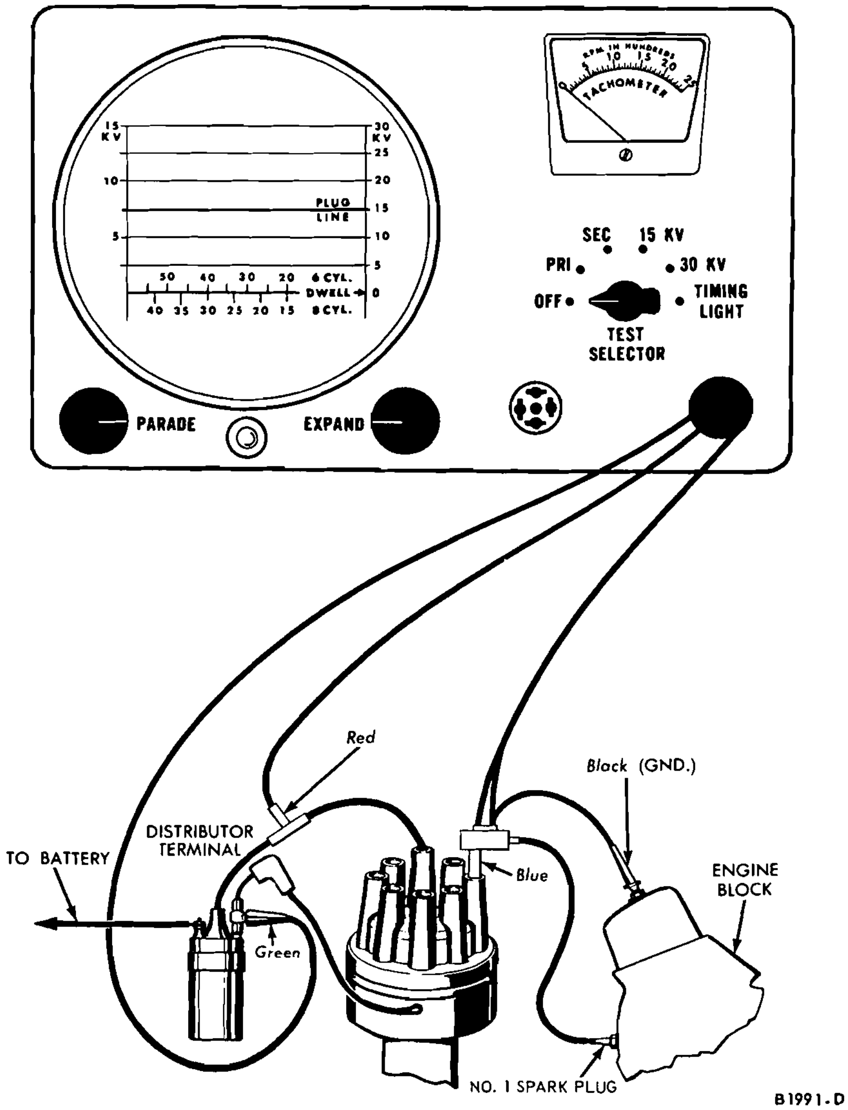

FIG. 10— Rotunda ARE-27-55 Test Connections

nect the black lead to a good ground.

5. Clip the red pickup over the coil-to-distributor high tension wire.

6. If the engine timing is to be checked, plug the timing light into its socket.

The following steps pertain to the ARE-881 tester only.

7. Disconnect the battery positive and negative cables at the battery.

8. Install the battery adapter on the positive battery post.

9. Connect the battery positive cable to the battery adapter.

10. Connect the shunt spade terminal and the yellow lead to the battery cable post on the battery adapter.

11. Connect the shunt to the adapter.

12. Connect the battery negative cable to the battery negative terminal and connect the black lead to the battery negative terminal.

13. Turn the ground polarity switch to the minus position. Turn the VOLTS switch to the 20-volt position.

POINT RESISTANCE TEST ARE-881 TESTER

Conventional Ignition System

This test checks the voltage drop from the distributor terminal of the coil, through the primary wire and the breaker points and to ground.

1. Remove and ground the high tension wire from the center of the distributor.

2. Depress the VOLT AMP pushbutton and turn the VOLTS switch to the PT. RES. position.

3. Disconnect the brown wire (I terminal) and the red and blue wire (S terminal) at the starter relay. Install an auxiliary starter switch between the battery and S terminals of the starter relay. With the ignition switch ON, tap the auxiliary starter switch until the lowest voltmeter reading is obtained.

4. Depress the PT. RES. pushbuttom.

5. The voltmeter pointer should read in the 12V black, PT. RES. area. If it doesn't, check for improper breaker point spring tension, a loose or defective primary or ground wire or for burned or pitted points.

6. Connect the high tension wire to the distributor.

7. Turn the ignition switch OFF and turn the VOLTS switch to the 20V position.

8. Remove the auxiliary starter switch from the starter relay and connect the brown wire and the red and blue wire to the starter relay.

IGNITION TIMING

The following procedure checks the initial ignition timing and the ignition advance mechanism.

Section 2 of this part gives the ignition timing mark locations.

Disconnect the distributor vacuum line (if so equipped). Clean and mark the desired timing mark if using the ARE-27-55 tester or the TDC timing mark if using the ARE-881 tester.

ARE-27-55 Tester

1. Start the engine and allow it to warm up.

2. Turn the TEST SELECTOR to the TIMING LIGHT position.

3. Operate the engine at the specified idle rpm and point the timing light toward the pointer. The desired timing mark should line up with the pointer. If it doesn't, loosen the distributor hold-down bolt and rotate the distributor until the mark lines up with the pointer. Now tighten the hold-down bolt and check the timing again in case the timing changed while the distributor hold-down bolt was being tightened.

4. Connect the distributor vacuum line (if so equipped).

5. With the timing light pointed towards the timing marks, accelerate the engine to see if the timing advances.

ARE-881 Tester

1. Turn the RPM selector to the 800 position.

2. Depress the ADVANCE TIMING pushbutton.

3. Start the engine and allow it to warm up.

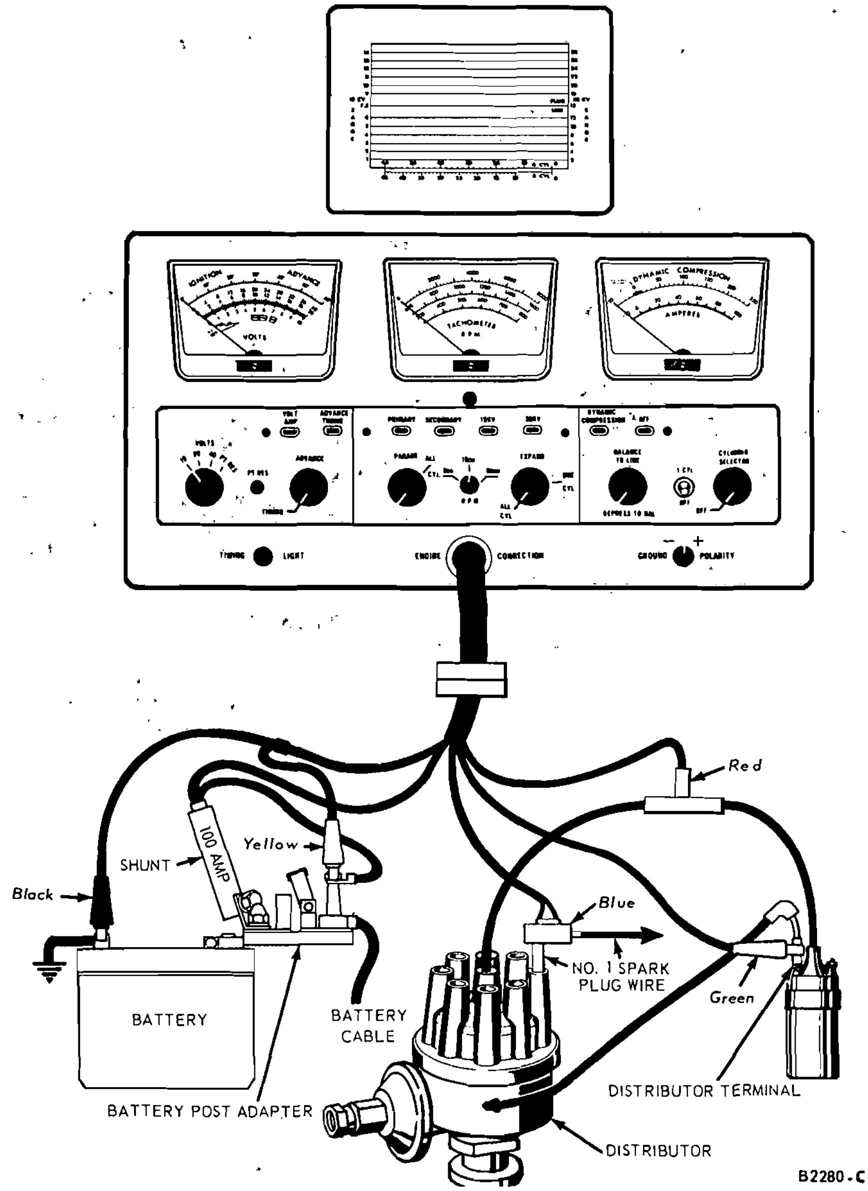

FIG. 11—Rotunda ARE-881 Test Connections

4. Operate the engine at the specified idle rpm.
5. Point the timing light toward the timing pointer and turn the ADVANCE control until the TDC mark lines up with the pointer. The IGNITION ADVANCE scale of the VOLTS meter will indicate the initial timing. If the initial timing is incorrect, loosen the distributor hold-down bolt and rotate the distributor until the desired timing is obtained. Tighten the distributor hold-down bolt and check the timing again in case the timing changed while the distributor hold-down bolt was being tightened.
6. Connect the distributor vacuum line (if so equipped).
7. Turn the RPM switch to the 8000 position and adjust the engine speed to 2000 rpm.
8. Point the timing light toward the timing pointer and turn the ADVANCE control until the TDC mark lines up with the pointer. The IGNITION ADVANCE scale of the VOLTS meter will indicate the total ignition advance for 2000 rpm.

When checking the advance at 2000 rpm, the total ignition advance should be the sum of the initial timing and the 2000 rpm advance specification given with the distributor vacuum line connected.

If the advance with the distributor vacuum line connected is correct, the total advance at 2000 rpm is correct. This means that the vacuum and centrifugal advance mechanisms are probably operating within specifications.

If the advance with the distributor vacuum line disconnected is correct and the advance with the distributor vacuum line connected is incorrect, the vacuum advance needs adjustment on a distributor tester.

If the advance with the distributor vacuum line disconnected is incorrect and the advance with the distributor vacuum line connected is incorrect, the centrifugal advance and possibly the vacuum advance needs adjustment on a distributor tester.

PRIMARY CIRCUIT SUPERIMPOSED PATTERN

This pattern shows the individual firing patterns as seen by the primary circuit. The individual firing patterns are superimposed to give the appearance of one firing pattern.

The primary circuit superimposed pattern will indicate incorrect battery polarity, incorrect dwell angle, excessive primary circuit resistance, partially shorted condenser, uneven distributor cam lobes, bent distributor shaft or worn distributor bushings.

Procedure

ARE-27-55 Tester

1. With the engine running at 1000 rpm, turn the TEST SELECTOR switch to the PRI. position.
2. Adjust the PARADE control to position the left end of the pattern at the 6-cyl 60 ° dwell mark on the scope screen.
3. Adjust the EXPAND control so that the right end of the pattern is at the 6-cyl 0 ° dwell mark on the scope screen.

ARE-881 Tester

1. Turn the RPM selector to the 1600 rpm position. Start the engine and adjust it to 1000 rpm.
2. Depress the PRI. pushbutton on the console panel.
3. Adjust the PARADE control to position the left end of the pattern at the 6-cyl 60 ° dwell mark on the scope screen.
4. Adjust the EXPAND control so that the right end of the pattern is at the 6-cyl 0 ° dwell mark on the scope screen.

Results

A normal test pattern is shown in Fig. 12.

Point A indicates the spark plug firing line which is the time when the

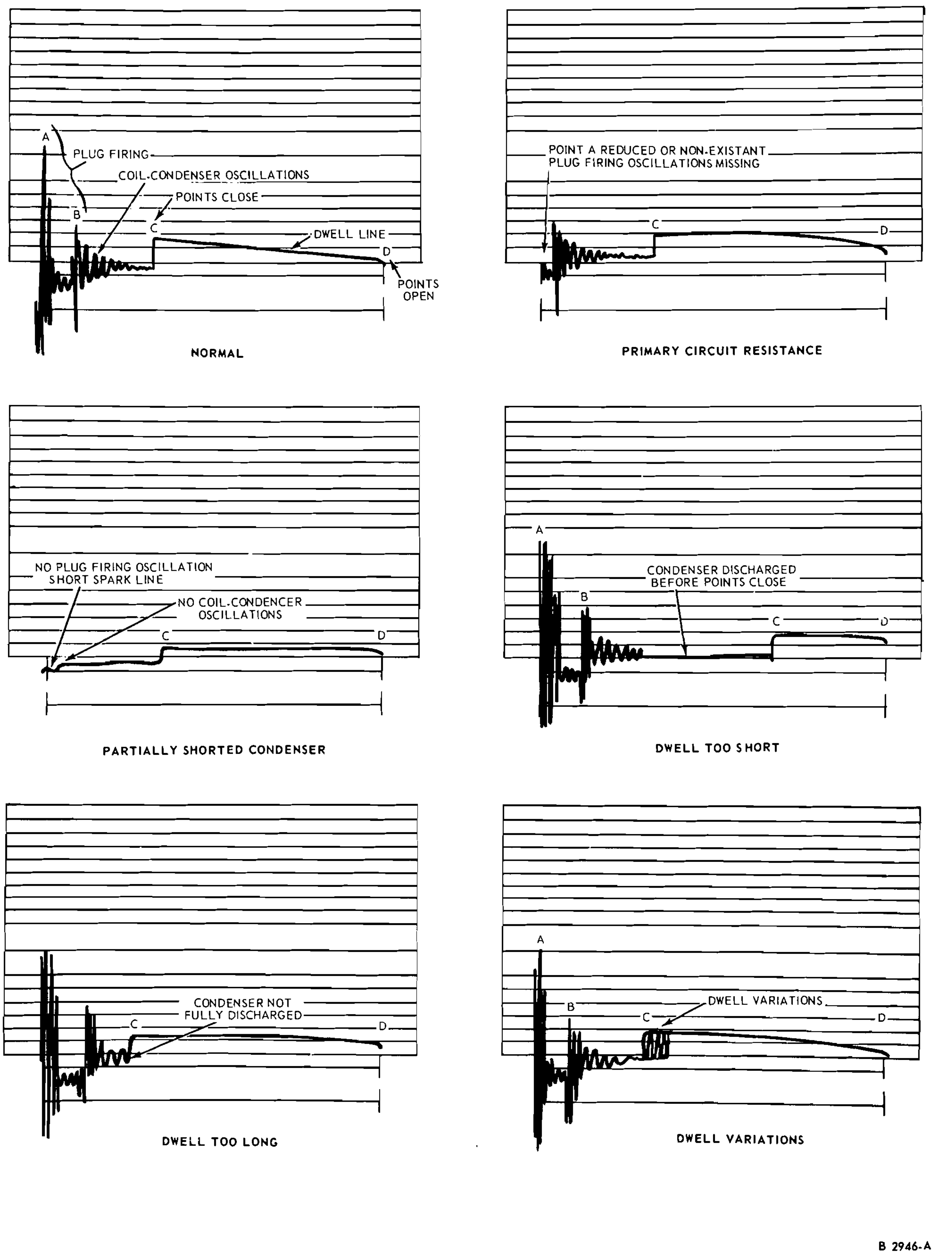

FIG. 12—Primary Circuit Superimposed Patterns

points open. The pattern between A and B is the spark plug firing time. At B, the coil energy is used up sufficiently so that the plug no longer fires and only the energy stored in the breaker point condenser remains. The coil/condenser oscillation which is indicated in the pattern between B and C is completely used up at C which is the points close mark. The portion of the pattern between C and D is the points close time, which is cam angle or dwell time. At D, the points again open and the firing cycle repeats.

If the firing line is not below the 0 horizontal line and there are no oscillations at point C, there is an open circuit at the coil high tension tower. This could be caused by a broken wire inside the coil tower, or a broken center contact on the distributor rotor.

If the dwell time is too long or short (Fig. 12), the breaker points are incorrectly set (the larger the gap, the smaller the dwell).

If point A is at a reduced height, and the distance to B is short or nonexistent (Fig. 12), there is a high resistance in the coil primary circuit. This could be caused by a fouled plug, defective ignition switch, or a bad wire or connection. If the scope pattern is still the same after the above ignition parts have been checked and proven satisfactory, run the 15 KV test to check for a gasket leak or a lean fuel mixture.

If point A is at a greatly reduced height and there are no oscillations at point B, the condenser is partially shorted (Fig. 12).

If there is a variation of more than 3° at point C, the cam lobes are uneven, the distributor shaft is bent, or the distributor bushings are worn (Fig. 12).

SECONDARY CIRCUIT SUPERIMPOSED PATTERN

This pattern shows the individual firing patterns as seen by the secondary circuit. The individual firing patterns are superimposed to give the appearance of one firing pattern.

The secondary circuit superimposed pattern will indicate arching, breaker points, defective coil or coil high tension wire, excessive resistance in the distributor cap, rotor, secondary wiring or spark plugs or a loose connection in the primary circuit.

The ignition system, as seen by the secondary circuit, can be further checked by checking the 15 KV and 30 KV patterns.

Procedure

A RE-27-55 Tester

1. With the engine running at 1000 rpm, turn the TEST SELECTOR switch to the SEC. position.
2. Adjust the PARADE control so that the left end of the pattern is at the 6-cyl 60° dwell mark on the scope screen.
3. Adjust the EXPAND control so that the right end of the pattern is at the 6-cyl 0° dwell mark on the scope screen.

A RE-881 Tester

The procedure is the same as the procedure for the primary (superimposed) except, the SEC. pushbutton is depressed instead of the PRI. pushbutton.

Results

A normal test pattern is shown in Fig. 13.

Point A is the points open time. The height of the pattern at point A indicates the high tension voltage required to overcome the spark plug gap resistance.

The pattern between A and B is the plug firing line. Notice that this portion of the pattern is quite thick. Remember that this pattern is actually 6 or 8 firing patterns superimposed one on top of the other. This increase in thickness of the pattern at B is caused by slight variations in the plug gap, distributor rotor gap and slight differences in the resistance of the individual spark plug circuits.

The pattern area between points B and C shows the coil/condenser oscillations to be correct. No point bounce at C indicates correct breaker point spring tension (Fig. 13).

The few so-called damped oscillations appearing at C are normal and are caused by the surge of current through the coil primary winding when the breaker points first close.

This current levels off and decreases slightly toward the points open position at D as indicated by the slight downward slope of the curve at about the 8-cyl 15° mark on the cam angle scale.

To observe the coil/condenser oscillations and the damped oscillations at C in the greater detail, adjust the expand control so that the pattern area between points B and C nearly fills the screen.

If there is erratic action at points B and C, and there is a blotch above point D (Fig. 13), the breaker points are burned or badly pitted.

If there are no condenser oscillations between B and C and no damped oscillations at point C (Fig. 13), there are shorted primary windings in the coil.

If the plug firing line is sloping downward greatly from A to B (Fig. 13), there is a high resistance in the spark plug wires, distributor cap or rotor (resistor plugs will cause a slight slope). If the plug firing line is sloping upward, there is a high resistance in the spark plugs.

If the dwell line between points C and D is not the smooth line shown, there is a loose connection in the primary circuit. Check the primary circuit for loose connections, damaged wires or a defective starter switch.

SECONDARY CIRCUIT 15 KV PATTERN

This pattern shows the individual firing patterns as seen by the secondary circuit. The individual firing patterns are paraded from left to right in order of firing order.

The secondary circuit 15 KV pattern will indicate weak breaker point spring tension, improper breaker point contact, incorrect condenser capacitance, excessive resistance in the distributor cap terminal or a spark plug wire, shorted or improperly adjusted spark plugs, partially shorted coil primary windings or an incorrect idle fuel mixture.

Procedure

A RE-27-55 Tester

1. With the engine operating at 1000 rpm, turn the test selector switch to the 15 KV position.
2. Adjust the PARADE control so that the left end of the pattern is at the 6-cyl 60° dwell mark on the scope screen.
3. Adjust the EXPAND control so that the right end of the pattern is at the 6-cyl 0° dwell mark on the scope screen (Fig. 14).

A RE-881 Tester

1. With the RPM selector at the 1600 position and the engine operating at 1000 rpm, depress the 15 KV pushbutton.
2. Adjust the PARADE control so that the left end of the pattern is at the 6-cyl 60° dwell mark on the scope screen.
3. Adjust the EXPAND control so that the right end of the pattern is at the 6-cyl 0° dwell mark on the scope screen (Fig. 14).

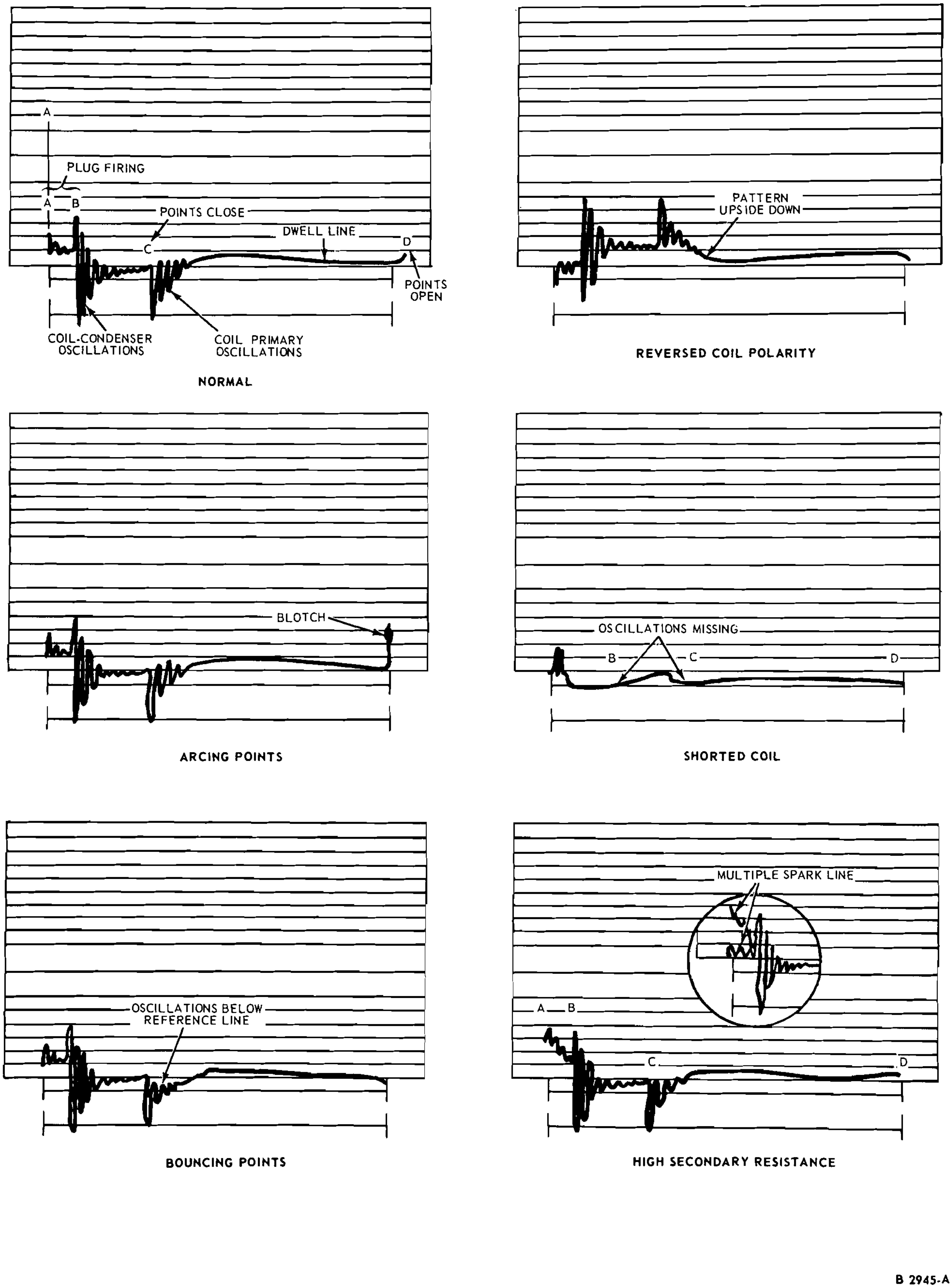

FIG. 13—Secondary Circuit Superimposed Patterns

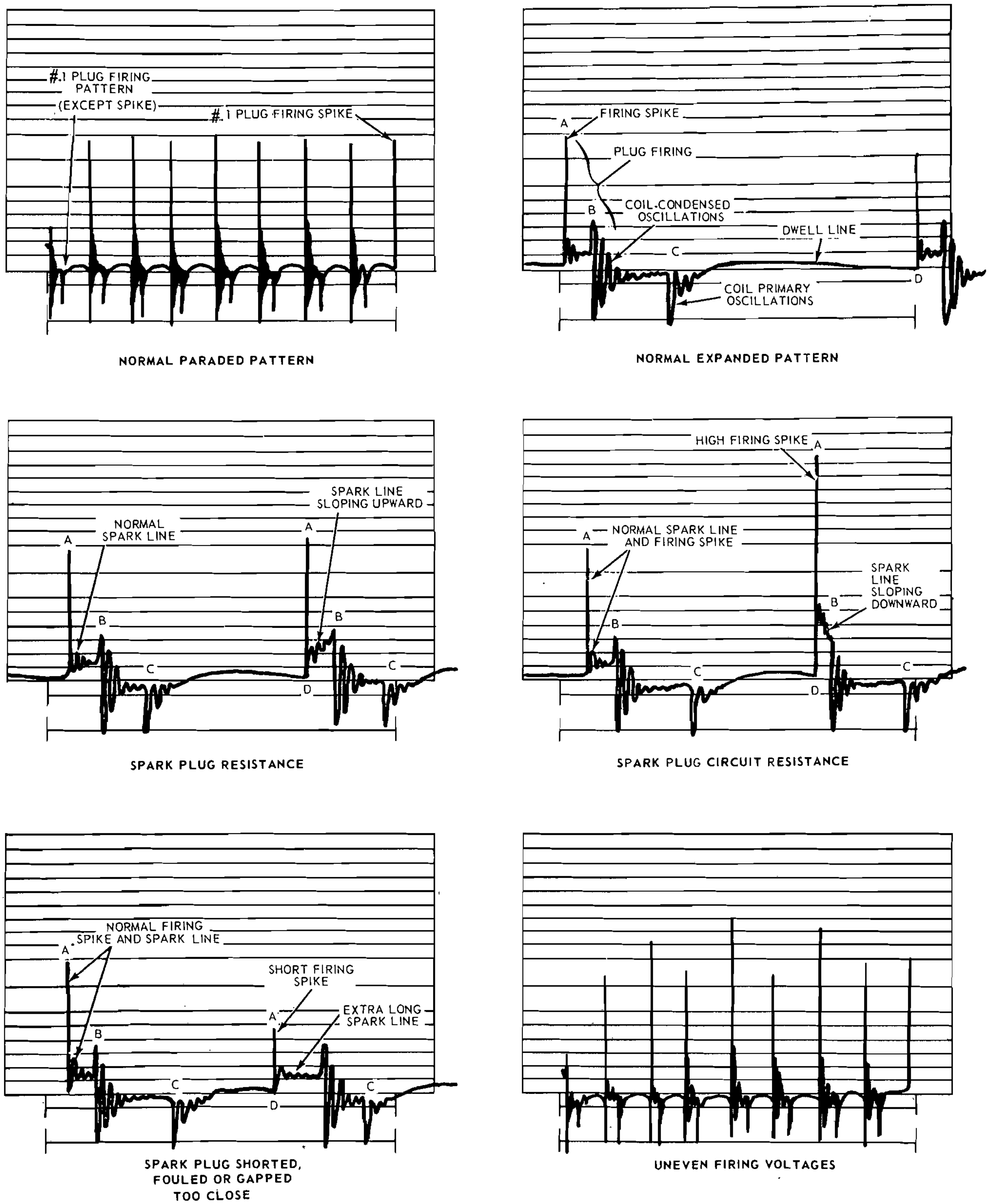

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FIG. 14—Normal Secondary Circuit 15 KV Patterns

Results

A normal eight cylinder engine 15 KV pattern is shown in Fig. 14. The six cylinder pattern would have six similar images. The spark plug line (A) for the No. 1 spark plug is on the extreme right hand side of the screen. The remainder of the No. 1 firing pattern is on the left side of the screen. The remainder of the patterns are shown from left to right in their firing order.

With the exception of the No. 1 spark plug line (which should be shorter than the others), the patterns should be similar. If one of the patterns differs from the others, adjust the expand and parade controls until that pattern fills the screen in the same manner as in the secondary test (Fig. 14).

The following list of symptoms will refer to Fig. 14.

The condenser oscillation signal from B to C should diminish to a straight line at C. If it doesn't, the condenser capacitance is incorrect.

If the plug firing line (A) is higher than the rest and the plug firing line (B) is sloped downward at an unusually large slope, there is excessive resistance in the high tension wire to that cylinder or in the distributor cap.

If the plug firing line (A) is low and the firing line is long and nearly straight, the spark plug is shorted, fouled, or gapped too close.

If all of the plug firing lines (A) are at varied heights, check the idle adjustment of the carburetor (always adjust the idle mixture on the rich side).

SECONDARY CIRCUIT 30 KV PATTERN

This pattern is like the 15 KV pattern with the exception of the height. The height has been reduced to allow for checking the coil reserve.

The secondary circuit 30 KV pattern will indicate excessive resistance in the plugs, insufficient coil reserve voltage or leakage at the rotor, distributor cap or spark plug wire.

Procedure

ARE-27-55 Tester

1. With the engine running at 600 rpm, turn the test selector switch to the 30 KV position.
2. Adjust the PARADE control so that the left end of the pattern is at the 6-cyl 60° dwell mark on the scope screen.
3. Adjust the EXPAND control so that the right end of the pattern is at the 6-cyl 0° dwell mark on the scope screen (Fig. 15).

ARE-881 Tester

1. With the RPM selector at the 1600 position and the engine operating at 600 rpm, depress the 30 KV pushbutton.
2. Adjust the PARADE control so that the left end of the pattern is at the 6-cyl 60° dwell mark on the scope screen.
3. Adjust the EXPAND control so that the right end of the pattern is at the 6-cyl 0° dwell mark on the scope screen (Fig. 15).

Results

A normal eight cylinder engine 30 KV pattern is shown in Fig. 15. The six cylinder pattern would have six similar images. The spark plug firing line (A) for the No. 1 spark plug is on the extreme right hand side of the screen. The remainder of the No. 1 firing pattern is on the left side of the screen. The remainder of the patterns are shown from left to right in their firing order.

Notice the average height of the plug firing lines. Increase the speed of the engine and notice the height of the dotted lines. The difference is the required ignition output under load. The maximum should be between 13.5 and 15 KV.

If the maximum for one or more of the plugs is above 15 KV (Fig. 15), check the complete circuit(s) of the plug(s) for any trouble that would cause resistance. If the maximum does not increase during the increase in engine speed, check for a fouled or improper gapped spark plug or for very low compression.

Remove the high tension wire at the distributor cap for any plug except No. 1. Notice the change between the average points open line and the points open line of the cylinder with the high tension wire removed. This height difference is the coil reserve. The coil reserve should be at least 20 KV. If it is less than 20 KV, replace the coil.

Remove and do not ground one spark plug wire at the spark plug. If a plug firing line shows up on the scope for that cylinder, check the plug wire, rotor and distributor cap for bad insulation.

DYNAMIC COMPRESSION TEST—ARE-881 TESTER

Procedure

1. Turn the RPM selector to the 1600 position and depress the DYNAMIC COMPRESSION pushbutton.
2. On a car equipped with a transistor ignition system, insert the ARE-500 adapter into the test circuit. To do this, proceed as follows:

   Remove the ARE-881 green lead and connect it to the ARE-500 green lead.

   Connect the ARE-500 red lead to the coil positive (+) terminal.

   Connect the ARE-500 black lead to the coil negative (−) terminal.

   Turn the ARE-500 control switch to the DYNAMIC COMPRESSION position.
3. Adjust the engine to 1500 rpm.
4. Adjust the EXPAND and PARADE controls so that the six patterns (6-cyl) or eight patterns (8-cyl) fill the scope screen dwell range.
5. Press and turn the BALANCE TO LINE control to position the needle on the DYNAMIC COMPRESSION scale at the 0 mark. Hold the BALANCE TO LINE control in until you are ready to read the dynamic compression.
6. The shorting pattern indication as shown at 5 in Fig. 16 will appear at point A.
7. Turn the CYLINDER SELECTOR control clockwise from its OFF position. As the switch is turned clockwise, the pattern indication will move to the right across the scope.
8. When the pattern indication passes through the firing pattern for cylinder number 5, the plug firing line will disappear as shown for the fourth cylinder in the firing order (cylinder number 2) and the engine will miss on the number 5 cylinder.
9. Release the BALANCE TO LINE control and observe the dynamic compression meter reading for the number 5 cylinder.
10. Continue to rotate the CYLINDER SELECTOR control to duplicate the above condition for each cylinder in the system except number one (last plug firing line).
11. Turn the CYLINDER SELECTOR control to its maximum clockwise rotation.
12. Turn the NO. 1 CYL., switch on.
13. Slowly turn the CYLINDER SELECTOR control counterclockwise until the pattern shown in Fig. 16 is obtained.
14. Observe the dynamic compression meter reading for the number 1 cylinder.

NOTE: If the engine rpm should change from 1500 rpm, set the speed back to 1500 rpm and repeat step 5.

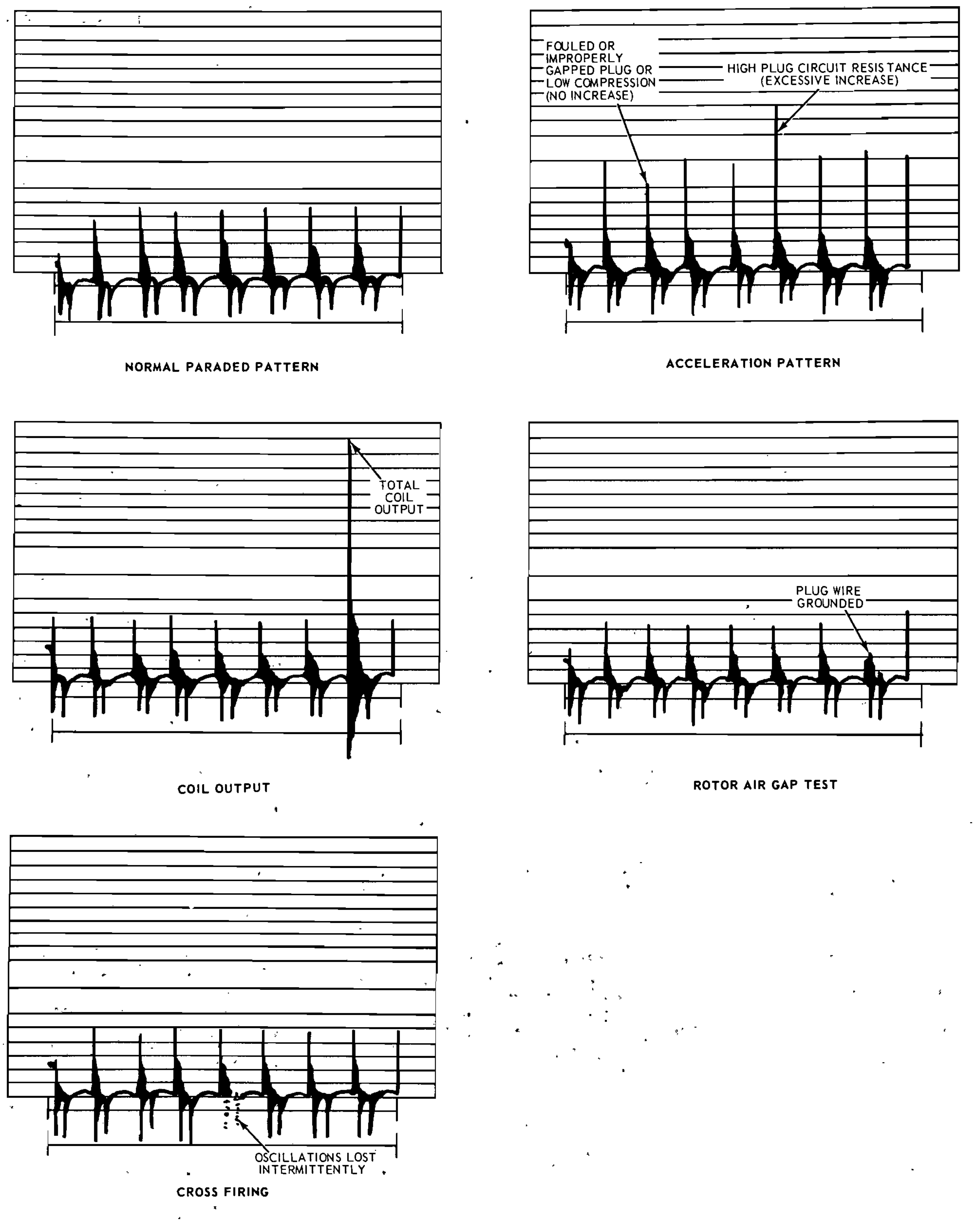


FIG. 15—Normal Secondary Circuit 30 KV Pattern

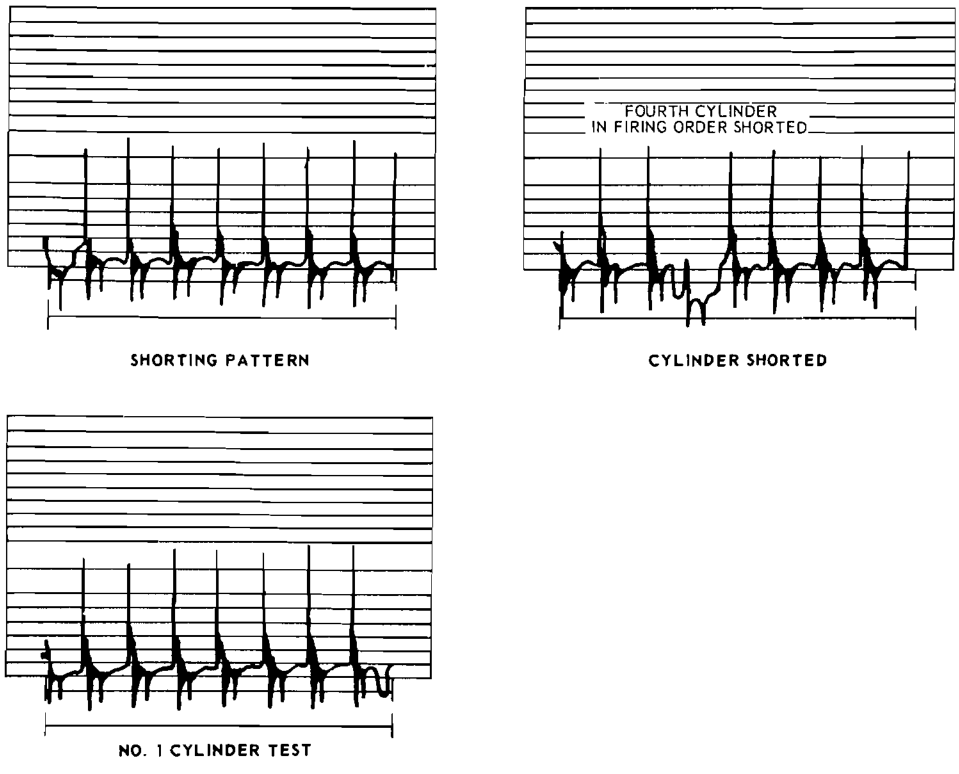


FIG. 16—Dynamic Compression Pattern

Results

The readings obtained are relative readings. However, if the engine compression and firing conditions are normal, the readings for all cylinders will be approximately the same.

If the readings are not within 3 divisions of each other, the cylinder(s) with the low reading(s) are not operating as efficiently as the other cylinders.

A cylinder (or cylinders) that is not operating efficiently indicates one or more of the following causes:

Low Compression caused by worn piston rings, leaking valves, leaking cylinder head gasket and/or damaged piston or rings.

Intake Vacuum Leak caused by leaking manifold, carburetor or carburetor spacer gaskets.

Malfunctioning Crankcase Ventilation Regulator Valve.

Carburetor Air Cleaner Restricted.

DISTRIBUTOR CHECKS

DISTRIBUTOR GEAR BACKLASH—LOADOMATIC DISTRIBUTOR

The distributor gear backlash can not be accurately checked on the dual advance or centrifugal advance distributor.

1. Mount a dial indicator on the distributor so that the indicator point rests on the rotor, 5/8-inch from the center.
2. Turn the rotor as far as it will go and set the indicator on zero.
3. Turn the rotor in the opposite direction and note the reading on the dial indicator. This is the backlash.
4. The backlash should be 0.003 to 0.005 inch. If the backlash is not to specifications, it indicates an incorrect number of teeth on the distributor or camshaft gear, or excessively worn gears.

DISTRIBUTOR SHAFT END PLAY

If the shaft end play is not to specifications, check the location of the gear on the shaft (6-cyl. engine distributor) or the distributor shaft collar (8-cyl. engine distributor).

6-cyl. Engine Distributor

The shaft end play can be checked with the distributor installed on the engine.

1. Mount a dial indicator on the distributor so that the indicator tip rests on the top of the distributor shaft.
2. Push the shaft down as far as it will go and set the dial indicator on zero.
3. Pull the distributor shaft upward as far as it will go and read the end play. The end play should be within specifications with the distributor removed or installed.

8-cyl. Engine Distributor

1. Remove the distributor from the engine.
2. Place the distributor in the holding tool and clamp it in a vise with the gear end up.

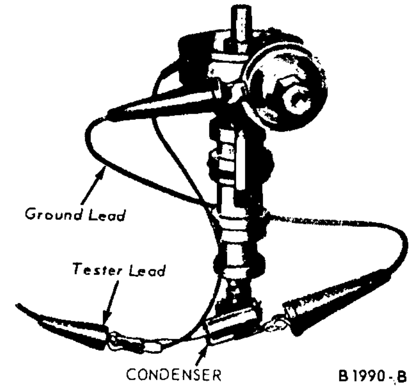


FIG. 17—Testing Transistor Ignition System Distributors

3. Push the distributor shaft upward as far as it will go, and check the end play with a feeler gauge placed between the collar and the distributor base. The end play should be within the specified limits. If the shaft end play is not to specifications, check the location of the distributor shaft collar.

DISTRIBUTOR TESTS— ROTUNDA ARE-27-44 WELL TESTER

TEST CONNECTIONS

Conventional Ignition System Distributor

1. Disconnect the distributor primary wire at the coil. Connect a short jumper wire to the DIST terminal of the coil and the distributor primary wire. Connect the red lead to the jumper wire.
2. Connect the black lead to a good ground on the engine.

Transistor Ignition System Distributor

1. Connect the red lead to the red (small) tach block terminal.
2. Connect the black lead to the black (large) tach block terminal.

DWELL ANGLE CHECK

1. Connect the tester.
2. Turn the test control knob to the set position.
3. Adjust the set control knob until the needle on the dwell meter lines up with the set line.
4. Start the engine and let it idle.
5. Turn the test control knob to the 8 CYL position for eight cylinder engines or to the 6 CYL position for 6 cylinder engines.
6. Read the dwell angle on the dwell meter and compare the reading to specifications.
7. Turn off the engine.
8. If the dwell angle was below the specified amount, the breaker point gap is too large. If the dwell angle was above the specified amount, the breaker point gap is too small.

On dual point distributors, the gaps of both breaker point assemblies should be the same.

If the dwell is to specifications, turn the test selector knob to the OFF position and disconnect the tester leads and jumper wire.

DWELL ANGLE ADJUSTMENT

If the dwell angle is not within specifications, proceed as follows:

1. Remove the coil high tension lead from the distributor and ground it.
2. Remove the distributor cap and place it out of the way.
3. Disconnect the brown wire (I terminal) and the red and blue wire (S terminal) from the starter relay.
4. Loosen the breaker point assembly retaining screw near the breaker point contacts.
5. With the ignition on, crank the engine with an auxiliary starter switch connected between the battery and S terminals of the starter relay and adjust the gap to specifications.
6. Release the auxiliary starter switch and tighten the breaker point assembly retaining screw.
7. Since the adjustment may have changed when the retaining screw was tightened, crank the engine again with the auxiliary starter switch and check the dwell. When the dwell is properly adjusted, remove the jumper wire, auxiliary starter switch and tester leads and install the distributor cap, coil high tension lead and starter relay wires.

On dual-point distributors, when the combined dwell has been set to specifications, the individual dwell settings should be checked. To check the individual dwell settings, block one set of points open with a piece of insulating material and check the dwell of the other set. The individual dwell settings should be the same.

DISTRIBUTOR TESTS— ROTUNDA DISTRIBUTOR TESTER

MOUNTING DISTRIBUTOR

ARE-236 Tester

1. Adjust the distributor support arm in relation to the distributor shaft length.
2. Set the distributor in the support arm and enter the lower end of the distributor shaft in the Syncrograph chuck.
3. Tighten the chuck on the distributor shaft, using the wrench located near the support arm column.
4. Align the distributor shaft by shifting the support arm and distributor, and tighten the clamp screw.
5. Clamp the distributor securely in the distributor support arm clamp so that it will not turn in its mounting.
6. Connect the Synchrograph test lead to the primary or distributor-transistor lead wire of the distributor.
7. Connect the tester vacuum line to the vacuum diaphragm fitting. **Since the transistor ignition distributor does not have a condenser, it will be necessary to install one in the circuit of the tester (Fig. 17).**

ARE-14-16 Tester

1. Clamp the distributor securely in the distributor support arm clamp so that it will not turn in its mounting.
2. Loosen the hand-operated locking screw on the side of distributor support arm, and adjust the support arm column up or down by turning the crank on the knob at the top of the column until the distributor shaft or adapter shaft can be securely fastened in the driving chuck.
3. Securely tighten the drive chuck to the distributor drive shaft by means of the chuck key, attached by a chain to the Synchrograph.
4. Rotate the drive chuck by hand to make sure the distributor shaft turns freely and then tighten the locking screw on the distributor support arm.
5. Connect the Synchrograph test lead to the primary or distributor-transistor lead wire of the distributor.

BREAKER POINT RESISTANCE

ARE-14-16 Tester

1. Turn the test selector to the POINT RES. position.
2. Revolve the chuck by hand until the distributor breaker contacts are closed.
3. The meter pointer on the cam angle meter should read in the OK zone at the left side of the meter scale. If the meter pointer does not fall in the OK zone, there is excessive resistance caused by a faulty contact across the distributor points, a faulty primary lead, or a poorly grounded base plate. A faulty contact across the distributor points indicates improper spring tension or burned or pitted points.

INSULATION AND LEAKAGE

ARE-236 and ARE-14-16 Testers

1. Turn the test selector to the cam angle position and revolve the chuck by hand until the distributor breaker contacts are open.
2. The cam angle meter should show a zero reading. If a zero reading is not obtained, a short circuit to ground exists.

A short could be caused by poor primary wire insulation, a shorted condenser or a short between the breaker arm and breaker plate.

MECHANICAL OPERATION

1. Turn the OFF, SET, CAM, SYNC. switch to the SET position.
2. Adjust the SET TACH control so that tachometer pointer is on the SET line.
3. Turn the OFF, SET, CAM, SYNC. switch to the SYNC. position.
4. On an ARE-14-16 Tester, turn the test selector to the SYNCHRO. position and check to make sure that the drive chuck is securely tightened on the distributor shaft.
5. Turn the MOTOR switch to the LEFT for 8 cylinder cars or to the RIGHT for 6 cylinder cars.
6. Adjust the speed control to vary the distributor speed between 400 and 4000 engine rpm, or at the maximum speed of the engine on which the distributor is used. Erratic or thin faint flashes of light preceding the regular flashes as the speed of rotation is increased can be due to weak breaker arm spring tension or binding of the breaker arm on the pivot pin.
7. Operate the distributor at approximately 2500 engine rpm and move the protractor scale so that the zero degree mark on the scale is opposite one of the neon flashes. The balance of all the flashes should come within 1° plus or minus, evenly around the protractor scale. A variation larger than 1° or erratic or wandering flashes may be caused by a worn cam or distributor shaft or a bent distributor shaft.

DWELL ANGLE

Single Point Distributors

1. On an ARE-236 Tester turn the OFF, SET, CAM, SYNC. switch to the CAM position. Operate the distributor at about 1000 rpm.
2. On a ARE-14-16 Tester, turn the cylinder selector to the 8 position.

Turn the test selector switch to the cam angle position and operate the distributor at approximately 1000 engine rpm.

3. Adjust the breaker point gap until the dwell angle is to specifications.

Dual Point Distributors

1. Turn the OFF, SET, CAM, SYNC. switch to the CAM position. Operate the distributor at about 1000 rpm.
2. Adjust the breaker points until the combined dwell is to specifications and the individual dwell settings are the same.

The individual dwell settings are checked by isolating one set of points from the circuit. This is done by placing a piece of insulating material between the contacts.

BREAKER PLATE WEAR

A worn breaker plate on the loadomatic or dual advance distributors will cause the breaker point gap and contact dwell to change as engine speed and load conditions are varied.

On the loadomatic distributor, there should not be over a 3° variation in dwell between engine idle speed and 2500 rpm. If the contact dwell changes more than 3°, the plate and bushing should be replaced.

On the dual advance distributor, adjust the test set to 0° advance, 0 inches vacuum, and 1000 rpm. Adjust the dwell angle to 26°. Apply vacuum to the distributor diaphragm and increase it very slowly while observing the indicated dwell angle. The maximum dwell angle variation should not exceed 6° when going from zero to maximum vacuum at constant rpm. If the dwell angle variation exceeds this limit, there is excessive wear at the stationary subplate pin or the diaphragm rod is bent or distorted.

DISTRIBUTOR SPARK ADVANCE

The spark advance is checked to determine if the ignition timing advances in proper relation to engine speed and load.

Loadomatic Distributor

1. Check the breaker point contact dwell. If the contact dwell is not within specifications, adjust the breaker points.
2. Check the breaker arm spring tension. Adjust it if necessary.
3. Adjust the test set to 0° advance. 0 inch vacuum and the initial rpm setting listed in the specifications.
4. Check the operation of the vacuum advance at the lowest and highest vacuum and rpm settings given in the specifications.

If the spark advance is not within the limits under low vacuum, the primary spring adjustment is at fault. If the spark advance is not within the limits under high vacuum, the secondary spring adjustment is at fault.

To adjust the spark advance, release the tension on the retard springs by turning the adjusting posts as required (Fig. 18). Adjust the primary spring (spring closest to the vacuum chamber) first, for the low vacuum settings. Adjust the secondary spring last, for the high vacuum settings. As a final check, check the advance throughout the entire range.

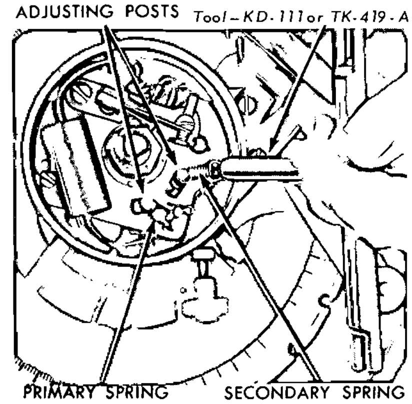


FIG. 18—Spark Advance Adjustment

If it is impossible to adjust both springs to give the correct spark advance throughout the range, one or both springs should be replaced and the spark advance readjusted. If the advance characteristics still cannot be brought within specifications, check the diaphragm assembly as follows:

Adjust the vacuum pressure of a distributor tester to its maximum position. Hold your hand over the end of the tester's vacuum hose and note the maximum reading obtained. **Do not exceed 25 inches Hg.**

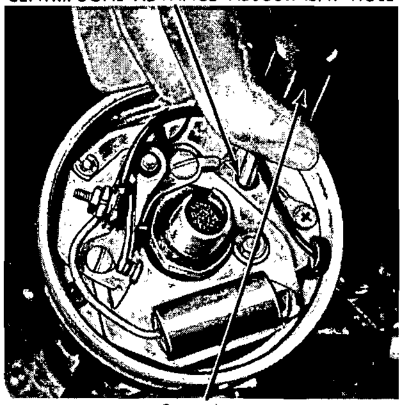
If the maximum reading is 25 inches Hg or less, connect the tester's vacuum line to the vacuum fitting on the diaphragm **without changing any of the adjustments.** The maximum gauge reading should not be less than it was above. If it is less, the diaphragm is leaking and should be replaced.

Dual Advance Distributor

1. Check the contact dwell. If the contact dwell is not within specifications, adjust the breaker points.
2. Check the breaker arm spring tension and adjust it, if necessary.

The dual advance distributor has two independently operated spark advance systems. Each system is adjusted separately. **Adjust the centrif-**

CENTRIFUGAL ADVANCE ADJUSTMENT HOLE



Screwdriver B2010-B

FIG. 19—Centrifugal Advance Adjustment

ugal advance before adjusting the vacuum advance.

Centrifugal Advance

1. Operate the distributor in the direction of rotation (counterclockwise) and adjust the speed to the initial rpm setting listed in the specifications. Move the protractor scale so that one of the flashes lines up with the zero degree mark.
2. Slowly increase the rpm to the setting specified for the first advance reading listed in the specifications.

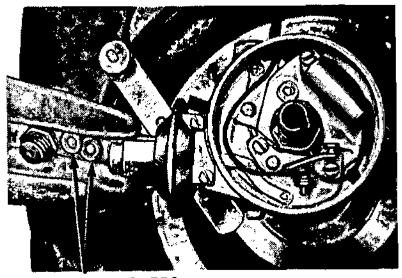
If the correct advance is not indicated at this rpm, stop the distributor and bend one spring adjustment bracket to change its tension (Fig. 19). Bend the adjustment bracket away from the distributor shaft to decrease advance (increase spring tension) and toward the shaft to increase advance (decrease spring tension). After the adjustment is made, identify the bracket.

3. After an adjustment has been made to one spring, check the minimum advance point again.
4. Operate the distributor at the specified rpm to give an advance just below the maximum. If this advance is not to specifications, stop the distributor and bend the other spring bracket to give the correct advance.
5. Check the advance at all rpm settings listed in the specifications. Operate the distributor both up and down the rpm range.

Vacuum Advance

1. Connect the test set vacuum line to the fitting on the diaphragm.

2. Set the test set at 0° advance, 0 vacuum, and at 1000 rpm.



SPACING WASHERS B2011-B

FIG. 20—Vacuum Advance Adjustment

3. Check the advance at the first vacuum setting given in the specifications.

4. If the advance is incorrect, change the calibration washers between the vacuum chamber spring and nut (Fig. 20). After installing or removing the washers, position the gasket in place and tighten the nut. **The addition of a washer will decrease advance and the removal of a washer will increase advance.**

5. After one vacuum setting has been adjusted, the others should be checked. **Do not change the original rpm setting when going to a different vacuum setting.** If the other settings are not within limits, there is incorrect spring tension, leakage in the vacuum chamber and/or line, or the wrong fibre stop has been installed in the vacuum chamber of the diaphragm housing.

To check the diaphragm for leakage:

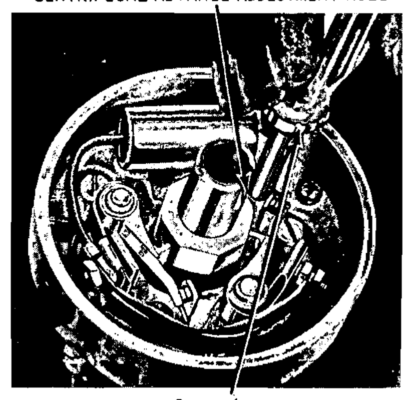
Remove the vacuum line from the distributor. Adjust the vacuum pressure of a distributor tester to its maximum position. Hold your hand over the end of the tester's vacuum hose and note the maximum reading obtained. **Do not exceed 25 inches Hg.**

If the maximum reading is 25 inches Hg or less, connect the tester's vacuum line to the vacuum fitting on the diaphragm **without changing any of he adjustments.** The maximum gauge reading should not be less than it was above. If it is less, the diaphragm is leaking and should be replaced.

Centrifugal Advance Distributor

1. On a high performance centrifugal advance distributor, check the gap of the breaker point assembly(ies) or the dwell (combined dwell on dual points).

CENTRIFUGAL ADVANCE ADJUSTMENT HOLE



Screwdriver B2326-B

FIG. 21—Centrifugal Advance Distributor Advance Adjustment

2. Check the breaker arm spring tension and adjust it if necessary.

3. Turn the OFF, SET, CAM, SYNC, switch to SYNC. position.

4. Operate the distributor in the direction of rotation and adjust the speed to the initial rpm setting listed in the specifications. Move the protractor scale so that one of the flashes lines up with the zero degree mark.

5. Slowly increase the rpm to the setting specified for the first advance reading listed in the specifications.

If the correct advance is not indicated at this rpm, stop the distributro and bend one spring adjustment bracket to change its tension (Fig. 21). **Bend the adjustment bracket away from the distributor shaft to decrease advance (increase spring tension) and toward the shaft to increase advance (decrease spring tension).** After the adjustment is made, identify the bracket.

6. After an adjustment has been made to one spring, check the minimum advance point again.

7. Operate the distributor at the specified rpm to give an advance just below the maximum. If this advance is not to specifications, stop the distributor and bend the other spring bracket to give the correct advance.

8. Check the advance at all rpm settings listed in the specifications. Operate the distributor both up and down the rpm range.

Lack of synchronization, excessive cam wear, worn bearings, or weak breaker arm spring tension causing contact point chatter are all disclosed by uneven or intermittent flashes around the protractor scale.

2 COMMON ADJUSTMENTS AND REPAIRS

BREAKER POINTS AND CONDENSER

REPLACEMENT

Loadomatic Distributors

Removal

1. Remove the distributor cap and rotor.
2. Disconnect the condenser and primary lead wires from the breaker point assembly.
3. Remove the breaker point assembly and condenser retaining screws and lift the breaker point assembly and condenser out of the distributor.

Installation

1. Place the breaker point assembly and condenser in position on the breaker plate and install the screws. Be sure that the ground wire is under the breaker point assembly screw nearest the breaker point contacts. Align and adjust the breaker points.
2. Connect the primary and condenser wires to the breaker point assembly.
3. Install the rotor and distributor cap.

Dual Advance Distributors—Conventional Ignition System

Removal

1. Remove the distributor cap and the rotor.
2. Disconnect the primary and the condenser wires from the breaker point assembly.
3. Remove the breaker point assembly and condenser retaining screws. Lift the breaker point assembly and condenser out of the distributor.

Installation

1. Place the breaker point assembly and the condenser in position and install the retaining screws. Be sure to place the ground wire under the breaker point assembly screw farthest from the breaker point contacts on an eight cylinder engine distributor or under the condenser retaining screw on a six cylinder engine distributor.
2. Align and adjust the breaker point assembly.
3. Connect the primary and condenser wires to the breaker point assembly.
4. Install the rotor and the distributor cap.

Dual Advance Distributor—Transistor Ignition System

Removal

1. Remove the distributor cap, the rotor, and the dust cover.
2. Disconnect the distributor-transistor wire from the breaker point assembly.
3. Remove the retaining screws from the breaker point assembly and lift the breaker point assembly out of the distributor.

Installation

1. Place the breaker point assembly in position and install the retaining screws. Be sure to place the ground wire under the breaker point assembly screw farthest from the breaker point contacts.
2. Align and adjust the breaker point assembly.
3. Connect the distributor-transistor wire to the breaker point assembly.
4. Install the dust cover, the rotor, and the distributor cap.

Centrifugal Advance Distributor—Conventional Ignition System

Removal

1. Remove the distributor cap and the rotor.
2. Disconnect the primary lead, the jumper strap, and the condenser lead from the breaker point assemblies.
3. Remove the retaining screws from the breaker point assemblies and the condenser. Lift the breaker point assemblies and the condenser out of the distributor.

Installation

1. Place the breaker point assemblies and the condenser in position and install the retaining screws.
2. Align and adjust the breaker point assemblies.
3. Connect the primary lead, the jumper strap, and the condenser lead to the breaker point assemblies.
4. Install the rotor and the distributor cap.

Centrifugal Advance Distributor—Transistor Ignition System

The replacement procedure is the same as the dual advance distributor with a transistor ignition system.

BREAKER POINT ALIGNMENT

The vented-type breaker points must be accurately aligned and strike squarely in order to realize the full advantages provided by this design and assure normal breaker point life. Any misalignment of the breaker point surfaces will cause premature wear, overheating and pitting.

1. Turn the cam so that the break-

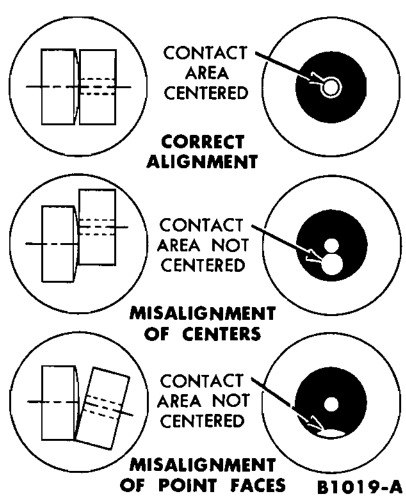


FIG. 22—Breaker Point Alignment

FIG. 23—Aligning Breaker Points

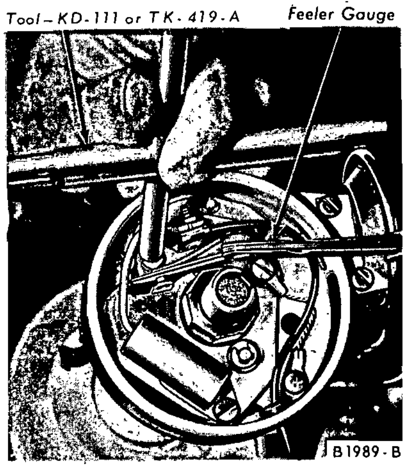


FIG. 24—Adjusting New Breaker Point Gap

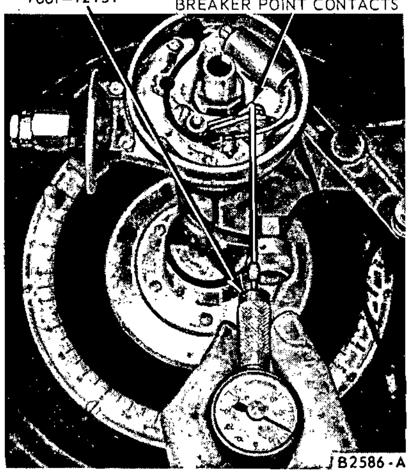


FIG. 25—Checking Breaker Point Spring Tension

er points are closed and check the alignment of the points (Fig. 22).

If the distributor is in the engine, close the points by proceeding as follows:

Disconnect the brown wire and the red and blue wire from the starter relay and, with the ignition switch off, crank the engine by using an auxiliary starter switch between the S and the battery terminals of the starter relay.

2. Align the breaker points to make full face contact by bending the stationary breaker point bracket (Fig. 23.) **Do not bend the breaker arm.**

3. After the breaker points have been properly aligned, adjust the breaker point gap or dwell.

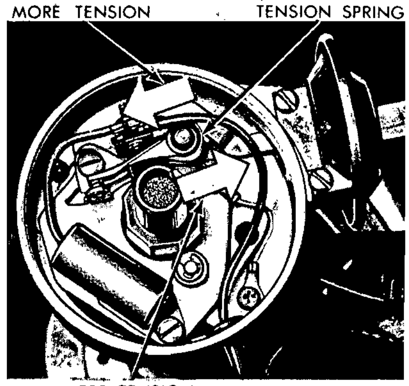


FIG. 26—Adjusting Breaker Point Spring Tension

BREAKER POINT GAP ADJUSTMENT

A scope, a dwell meter, or a feeler gauge can be used to check the gap of new breaker points.

A scope or a dwell meter can be used to check the gap of used breaker points. Due to the roughness of used points, it is not advisable to use a feeler gauge to check the gap.

To check and adjust the breaker points with a feeler gauge:

1. Check and adjust the breaker point alignment.

2. Rotate the distributor until the rubbing block rests on the peak of a cam lobe.

If the distributor is in the engine, place the rubbing block on the peak of the cam by proceeding as follows:

Disconnect the brown wire and the red and blue wire from the starter relay and, with the ignition switch off, crank the engine by using an auxiliary starter switch between the "S" and battery terminals of the starter relay.

Insert the correct blade of a clean feeler gauge between the breaker points (Fig. 24).

Apply a light film of distributor cam lubricant (C4AZ-19D530-A) to the cam when new points are installed. **Do not use engine oil to lubricate the distributor cam.**

Set the ignition timing.

If a scope or a dwell meter is used to adjust new points, be sure the points are in proper alignment. Also, set the contact dwell to the low setting.

To check and adjust the breaker points with a scope, refer to Ignition System Test—Rotunda Oscilloscope Testers.

To check and adjust the breaker points with a dwell meter, refer to Distributor Tests—Rotunda ARE-27-55 Dwell Tester.

BREAKER POINT SPRING TENSION ADJUSTMENT

Correct breaker point spring tension is essential to proper engine operation and normal breaker point life. If the spring tension is too great, rapid wear of the breaker arm rubbing block will result, causing the breaker point gap to close up and retard the spark timing. If the spring tension is too weak, the breaker arm will flutter at high engine rpm resulting in an engine miss.

To check the spring tension on either the pivot-type or the pivotless breaker points, place the hooked end of the spring tension gauge over the movable breaker point. Pull the gauge at a right angle (90°) to the movable arm until the breaker points just start to open (Fig. 25). If the tension is not within specifications, adjust the spring tension on the pivot-type points or replace the breaker point assembly on the pivotless points.

To adjust the spring tension (Fig. 27):

1. Disconnect the primary or distributor-transistor lead wire and the condenser lead if so equipped, and the jumper strap on the centrifugal advance distributor at the breaker point assembly primary terminal.

2. Loosen the nut holding the spring in position. **Move the spring toward the breaker arm pivot to decrease tension and in the opposite direction to increase tension.**

3. Tighten the lock nut; then check spring tension. Repeat the adjustment until the specified spring tension is obtained.

4. Install the primary or distributor-transistor lead wire, the condenser lead (if so equipped) and the jumper strap on the centrifugal advance distributor with the lockwasher and tighten the nut securely.

On the centrifugal advance distributor with dual breaker points, loosen the lock nut holding the jumper strap to the other breaker point assembly and follow steps 2 and 3. After the adjustment has been completed, connect the jumper strap.

IGNITION TIMING

TIMING MARK LOCATIONS

Six Cylinder Engines

The timing pointer (Fig. 27), has five timing marks ranging from top dead center (TDC) to 14° before top

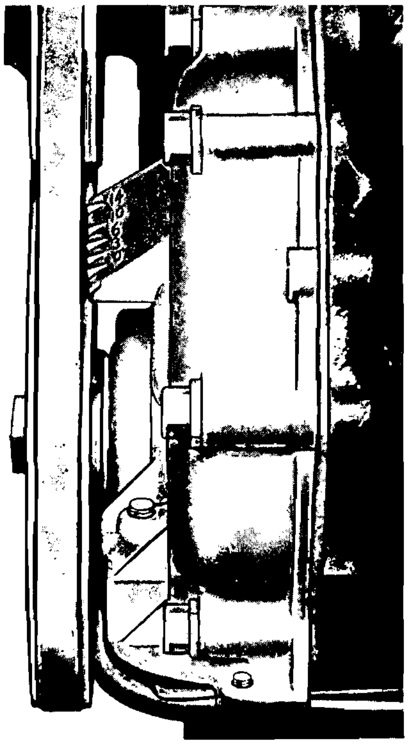


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FIG. 27—Typical Six-Cylinder Engine Timing Marks

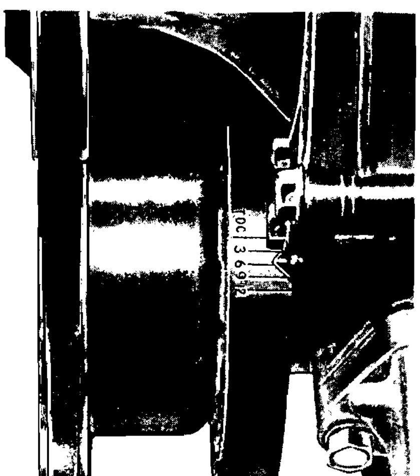

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FIG. 28—289 V-8 Engine Timing Marks

dead center (BTDC). The crankshaft pulley or damper has a timing notch.

V-8 Engines

The crankshaft damper for the 289 V-8 engine (Fig. 28) has five timing marks ranging from top dead center (TDC to 12° before top dead center (BTDC).

The 390 and 427 V-8 engines (Fig. 29) have 4 timing marks ranging from top dead center (TDC) to 30° before top dead center (BTDC).

ADJUSTMENT

The procedure for checking and adjusting the ignition timing with a scope is given in Section 1 of this part.

To check and adjust the timing with a Rotunda 13-07 power timing light, proceed as follows:

1. Remove the plug wire from the number 1 spark plug.
2. Install the spark plug adaptor on the spark plug.
3. Connect the plug wire to the spark plug adaptor.
4. Clamp the timing light spark plug lead to the spark plug adaptor.
5. Connect the timing light battery leads to the battery terminals.
6. Disconnect the distributor vacuum line (if so equipped).
7. If necessary, clean and mark the timing marks.
8. Operate the engine at the specified idle rpm and point the timing light at the timing pointer.
9. If the timing is incorrect, loosen the distributor hold down bolt and rotate the distributor until the desired initial advance is obtained.
10. Tighten the distributor hold down bolt and check the timing again.
11. Turn off the engine.
12. Remove the timing light and connect the vacuum line.

SPARK PLUG WIRE REPLACEMENT

When removing the wires from the spark plugs, grasp, twist and pull the moulded cap only. Do not pull on the wire because the wire connection inside the cap may become separated or the boot may be damaged.

240 SIX

The ignition wiring installation for this engine is shown in Fig. 30.

Removal

1. Disconnect the wires at the spark plugs and at the distributor cap.
2. Remove the coil high tension lead.

Cleaning and Inspection

Refer to Part 9-1, Section 3 for the proper cleaning and inspection procedures.

B1998-B

FIG. 29—Typical 390 and 427 V-8 Engine Timing Marks

Installation

1. Connect the wires to the proper spark plugs.
2. Install the boots on the distributor end of the wires and install the wires in the correct sockets in the distributor cap. Be sure the wires are forced all the way down into their sockets and that they are held firmly in position. The No. 1 socket is identified on the cap. Install the wires in a clockwise direction in the firing order (1-5-3-6-2-4) starting at the No. 1 socket.
3. Install the coil high tension lead. Push all boots into position.

ALL V8 ENGINES

The ignition wiring installation is shown in Fig. 31.

Removal

1. Disconnect the wires from the spark plugs and distributor cap.
2. Pull the wires from the brackets on the valve rocker arm covers and remove the wires.
3. Remove the coil high tension lead.

Cleaning and Inspection

Refer to Part 9-1, Section 3 for the cleaning and inspection procedures.

Installation

1. Insert each wire in the proper socket of the distributor cap. Be sure the wires are forced all the way down into their sockets. The No. 1 socket is identified on the cap. Install the wires in a counterclockwise direction in the firing order (1-5-4-2-6-3-7-8)

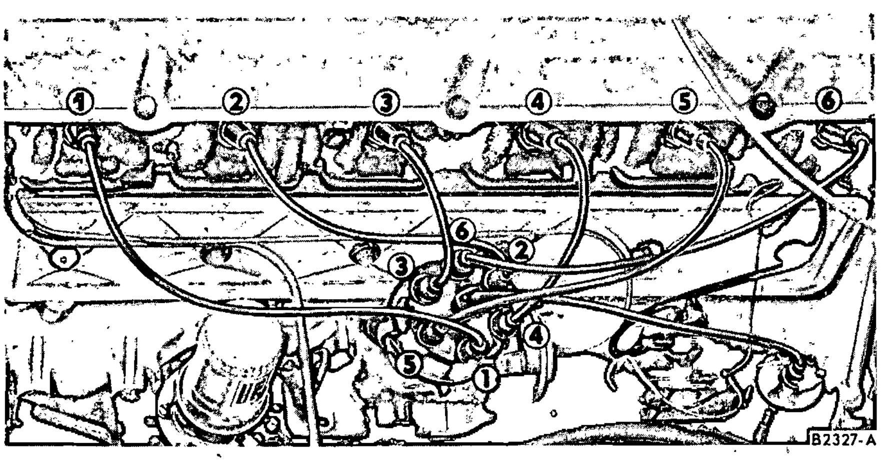

FIG. 30—240 Six Ignition Wiring

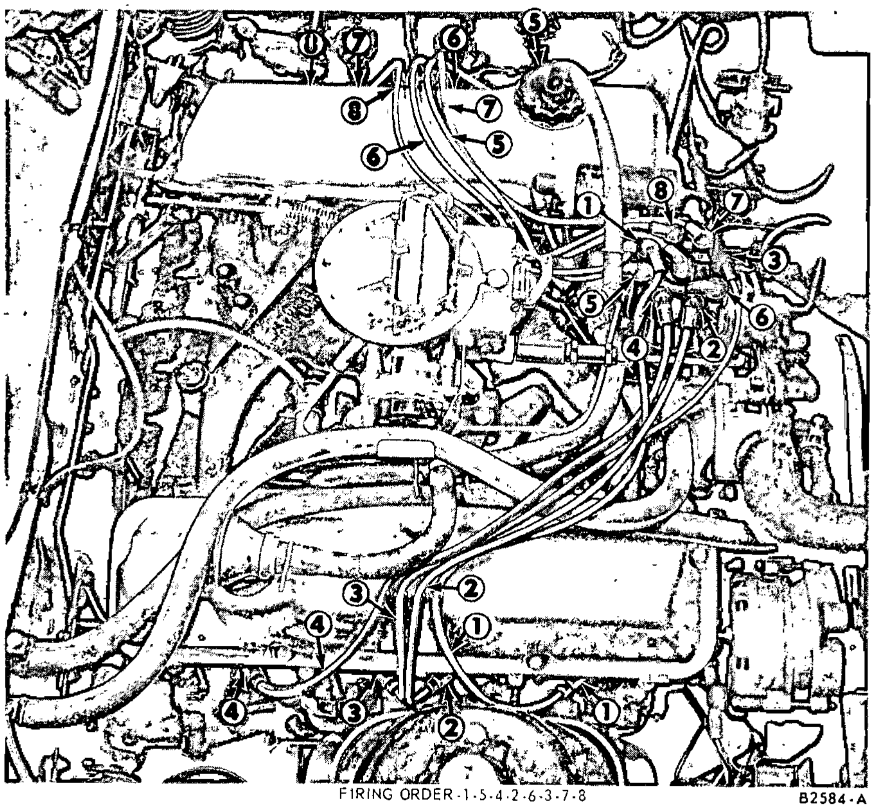

FIG. 31—Typical V-8 Ignition Wiring

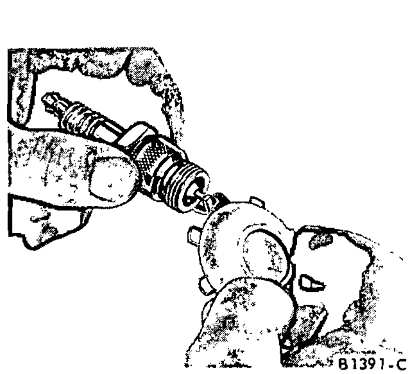

FIG. 32—Checking Spark Plug Gap

starting at the No. 1 socket. Cylinders are numbered from front to rear; right bank 1-2-3-4, left bank 5-6-7-8.

2. Remove the brackets from the old spark plug wire set and install them on the new set in the same relative position. Install the wires in the brackets on the valve rocker arm covers (Fig. 32). Connect the wires to the proper spark plugs. Install the coil high tension lead. **Be sure the No. 7 spark plug wire is positioned in the bracket as shown in Fig. 32.**

SPARK PLUGS

REMOVAL

1. Remove the wire from each spark plug by grasping, twisting and then pulling the moulded cap of the wire only. **Do not pull on the wire because the wire connection inside the cap may become separated or the boot may be damaged.**

2. Clean the area around each spark plug port with compressed air, then remove the spark plugs.

CLEANING AND INSPECTION

Refer to Part 9-1, Section 3 for the cleaning and inspection procedures.

ADJUSTMENT

Set the spark plug gap to specifications by bending the ground electrode (Fig. 32).

INSTALLATION

1. Install the spark plugs and torque each plug to 15-20 ft-lbs.

When a new spark plug is installed in a new replacement cylinder head, torque the plug to 20-30 ft-lbs.

2. Connect the spark plug wires.

RESISTANCE WIRE REPLACEMENT

CONVENTIONAL IGNITION SYSTEM

1. Disconnect the battery.

2. Disassemble the cluster housing from the instrument panel to expose the main instrument panel wiring.

3. Looking through the cluster opening near the center of the instrument panel, locate the single female connector with the red-green stripe and the red-yellow stripe wire. Disconnect the pink resistor wire and cut as close to the harness as possible.

4. Connect the new resistor wire assembly and route through the existing retainers along the harness to the multiple connector on the left hand side of the dash panel. Use tape to supplement the existing retainers to prevent wire from hanging loosely.

5. Cut the damaged pink resistor wire approximately 1 inch from the multiple connector and tape to the red-green stripe wire for the purpose of insulation.

6. Cut the red-green stripe wire approximately 1 inch from the taped portion and assemble a bullet terminal to each of the wire ends. Assemble a double connector between the two wire ends. Connect the remaining end of the new resistor wire into the double connector.

7. Connect the battery.

3 CLEANING AND INSPECTION

SPARK PLUGS

Examine the firing ends of the spark plugs, noting the type of deposits and the degree of electrode erosion. Refer to Fig. 33 for the various types of spark plug fouling and their causes.

Clean the plugs on a sand blast cleaner, following the manufacturer's instructions. **Do not prolong the use of the abrasive blast as it will erode the insulator and electrode.**

Clean the electrode surfaces with a small file (Fig. 34). Dress the electrodes to obtain flat parallel surfaces on both the center and side electrodes.

After cleaning, examine the plug carefully for cracked or broken insulators, badly pitted electrodes, and other signs of failure. Replace as required.

DISTRIBUTORS

Soak all parts of the distributor assembly (except the condenser, breaker point assembly, lubricating wick, vacuum diaphragm, distributor base oil seal and electrical wiring) in a mild cleaning solvent or mineral spirits. Do not use a harsh cleaning solution. Wipe all parts that can not be immersed in a solvent with a clean dry cloth.

After foreign deposits have been loosened by soaking, scrub the parts with a soft bristle brush. **Do not use a wire brush, file, or other abrasive object.** Dry the parts with compressed air.

Examine the bushing surface(s) of the distributor shaft and the bushing(s) for wear.

Inspect the distributor cam lobes for scoring and signs of wear. If any lobe is scored or worn, replace the cam assembly (dual advance and centrifugal advance distributor) or the shaft on a loadomatic distributor.

Inspect the breaker plate assembly for signs of distortion. In addition, on the dual advance distributor, inspect the stationary sub-plate for worn nylon contact buttons. Replace the breaker plate assembly if it is defective.

The breaker point assembly(ies) and condenser (if so equipped) should be replaced whenever the distributor is overhauled.

Inspect all electrical wiring for fraying, breaks, etc., and replace any that are not in good condition.

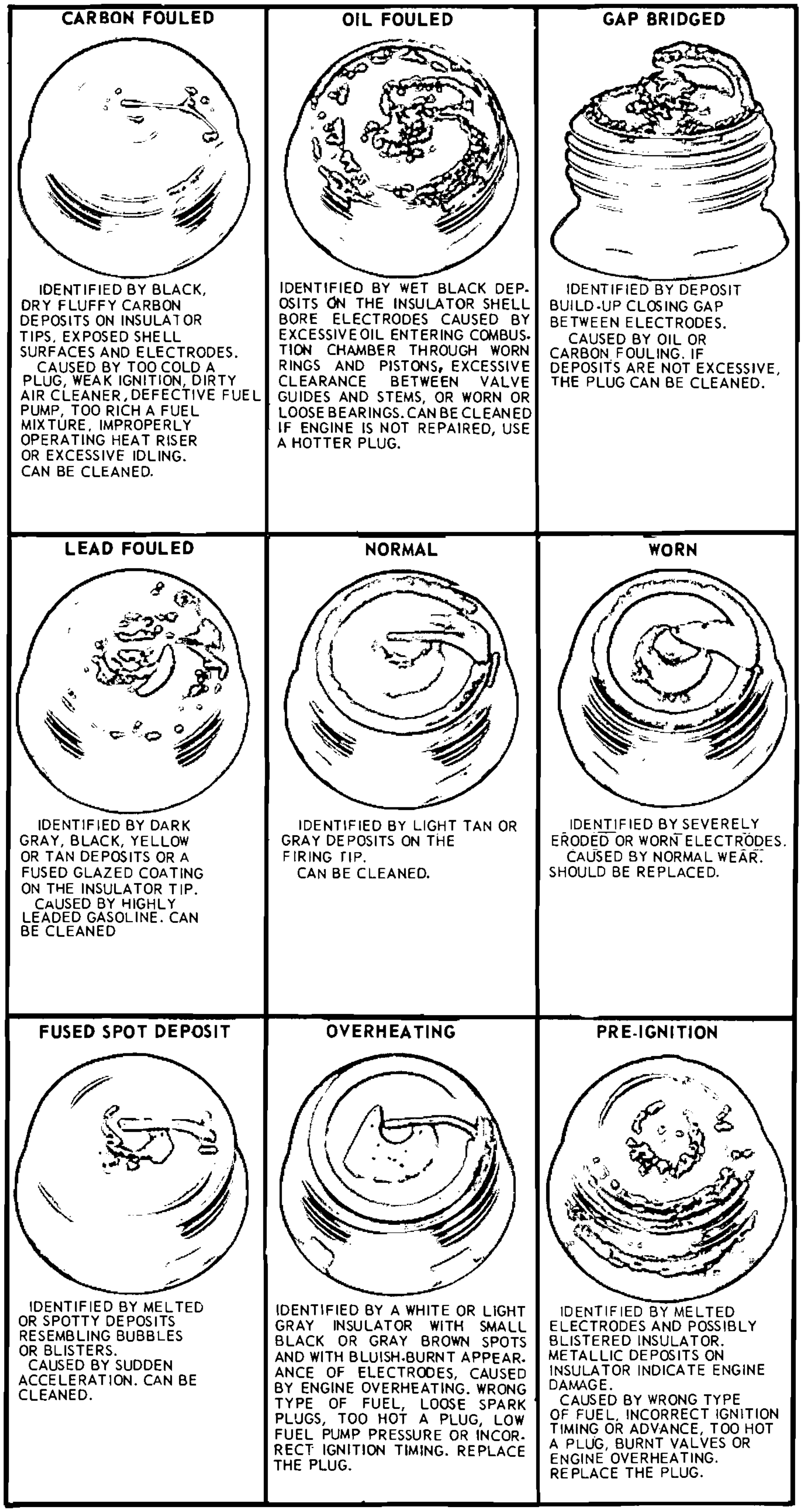

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FIG. 33—Spark Plug Inspection

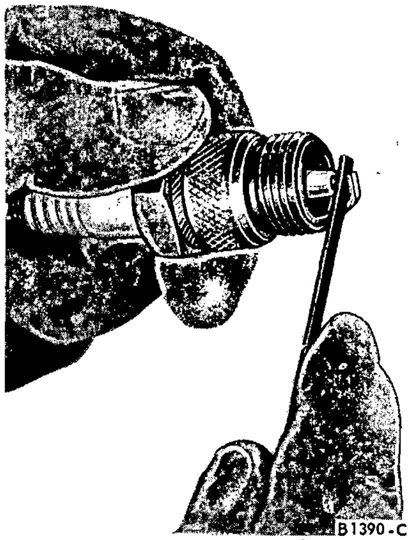


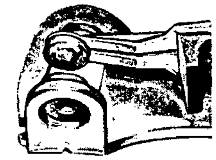
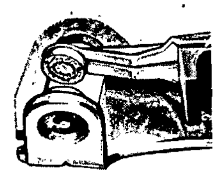
FIG. 34—Cleaning Spark Plug Electrode

Check the distributor base for cracks or other damage.

On a loadomatic or dual advance distributor, check the diaphragm housing, bracket, and rod for damage. Check the vacuum line fitting for stripped threads or other damage. Test the vacuum fittings, case, and diaphragm for leakage as explained under "Distributor Tests." Replace all defective parts.

The breaker point assembly consists of the stationary point bracket assembly, breaker arm and the mirmary wire terminal.

Breaker points should be inspected, cleaned and adjusted as necessary. Breaker points can be cleaned with chloroform and a stiff bristle brush. Replace the breaker point assembly if the contacts are badly burned or excessive metal transfer between the points is evident (Fig. 35). Metal transfer is considered excessive when it equals or exceeds the gap setting.

CONDITION	CAUSED BY
 BURNED	Any discoloration other than a frosted slate grey shall be considered as burned points.
 EXCESSIVE METAL TRANSFER OR PITTING	Incorrect alignment. Incorrect voltage regulator setting. Radio condenser installed to the distributor side of the coil. Ignition condenser of improper capacity. Extended operation of the engine at speeds other than normal.

B1443-B

FIG. 35—Breaker Point Inspection

SECONDARY WIRING

Wipe the wires with a damp cloth and check for fraying, breaks or cracked insulation. Inspect the terminals and boots for looseness or corrosion. Replace any wires that are not in good condition.

COIL

Wipe the coil with a damp cloth and check for any cracks or other defects.

DISTRIBUTOR CAP

Clean the distributor cap with a soft bristle brush and mild cleaning solvent or mineral spirits. Dry the cap with compressed air. Inspect the cap for cracks, burned contacts, permanent carbon tracks or dirt or corrosion in the sockets. Replace the cap if it is defective.

ROTOR

Clean the rotor with a soft bristle brush and mild cleaning solvent or mineral spirits. Dry the rotor with compressed air. Inspect the rotor for cracks or burning. Replace the rotor if it is defective.

PART 9-2— Loadomatic Distributors

1 DESCRIPTION AND OPERATION

The direction of distributor rotation is clockwise as viewed from the top of the distributor.

Engine speed and load requirements are satisfied by the action of the breaker plate which is controlled by a vacuum-actuated diaphragm working against the tension of two calibrated breaker plate springs (Figs. 1 and 2). The breaker plate is free to rotate on the shaft bushing. The diaphragm moves the breaker plate in a counterclockwise direction to advance the spark, and the springs move the plate in a clockwise direction to retard the spark. The degree of spark advance is determined by the strength of the vacuum acting on the diaphragm.

Vacuum is transmitted to the distributor diaphragm from two interconnected passages in the carburetor. The opening of one passage is in the throat of the venturi and the opening(s) of the other passage is in the throttle bore just above the closed throttle plate.

All manifold vacuum to the distributor passes through a spark control valve located in the carburetor throttle body or main body. Under steady part throttle operation, the spark valve is held open against the pressure of a calibrated spring. A combination of atmospheric pressure outside the spark valve diaphragm and manifold vacuum from within holds the spark valve open. When accelerating, manifold vacuum momentarily drops below a predetermined point and the calibrated spring closes the spark valve shutting off the manifold vacuum port. Vacuum from the venturi prevents full spark retard.

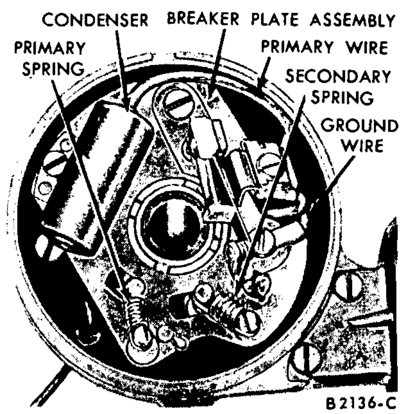


FIG. 1—Breaker Plate Installation

As engine speed approaches the throttle setting, manifold vacuum increases sufficiently to open the spark valve and allow a higher vacuum to operate the distributor.

At high engine speed, manifold vacuum falls and the valve closes. This prevents loss of venturi vacuum due to bleed back caused by the lower manifold vacuum. This assures full spark advance at high engine speed.

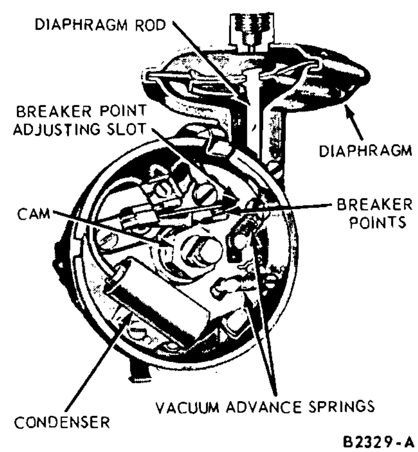


FIG. 2—Spark Advance Mechanism

The spark valve functions in a similar manner to provide an intermediate spark retard whenever the load on the engine is increased to a degree where normal road load spark advance would be too great and the wide-open throttle spark retard would reduce the efficiency of the engine.

2 IN-VEHICLE ADJUSTMENTS AND REPAIRS

BREAKER POINT AND/OR CONDENSER REPLACEMENT

The replacement procedures are covered in Part 9-1, Section 2.

VACUUM DIAPHRAGM REPLACEMENT

REMOVAL

1. Remove the distributor cap and rotor.
2. Remove the vacuum line from the diaphragm.
3. Remove the spring clip that secures the diaphragm link to the breaker plate.
4. Remove the diaphragm retaining screws and remove the diaphragm.

INSTALLATION

1. Install the vacuum unit on the distributor body. Insert the tip of the vacuum rod through the breaker plate and attach the rod with the spring clip.
2. Install the vacuum line in the diaphragm assembly and tighten the fitting.
3. Install the rotor and distributor cap.

ADJUSTMENTS

Refer to Part 9-1 for the proper procedures for adjusting the breaker points and spark advance.

3 REMOVAL AND INSTALLATION

REMOVAL

1. Disconnect the primary wire at the coil and remove the distributor cap.
2. Disconnect the vacuum line at the distributor.
3. Scribe a mark on the distributor body, indicating the position of the rotor, and scribe another mark on the body and engine block, indicating the position of the body in the block. These lines will be used as guides when installing the distributor in the correctly timed engine.
4. Remove the retaining bolt and lock washer and lift the distributor out of the block.

Do not rotate the crankshaft while the distributor is removed, or it will be necessary to time the engine.

INSTALLATION

1. If the crankshaft has not been rotated while the distributor was removed, position the distributor in the block with the rotor aligned with the mark previously scribed on the distributor body.

Install the distributor retaining screw.

2. If the crankshaft has been rotated while the distributor was removed, rotate the crankshaft until the No. 1 piston is on TDC after the compression stroke. Position the distributor in the block with the rotor at the No. 1 firing position. **Make sure the oil pump intermediate drive shaft is properly seated in the oil pump.** Install, but do not tighten, the distributor retaining bolt. Rotate the distributor body clockwise until the breaker points are just starting to open. Tighten the retaining bolt.
3. Connect the distributor primary wire and install the distributor cap.
4. Start the engine and adjust the ignition timing to specifications with a timing light. Connect the distributor vacuum line, and check the advance with the timing light when the engine is accelerated.

4 MAJOR REPAIR OPERATIONS

To perform the operations in this section, it will be necessary to remove the distributor from the vehicle.

BENCH DISASSEMBLY

The distributor assembly is shown in Fig. 3.

1. Install the distributor in a vise.
2. Remove the rotor and retaining clip.
3. Remove the the vacuum diaphragm rod and spring clip. Push the diaphragm rod out of the plate. Remove the vacuum diaphragm unit from the distributor.
4. Disconnect the primary and condenser wires from the breaker point terminal. Working from the inside of the distributor, pull the primary wire through the opening in the distributor.
5. Remove the condenser.
6. Remove the breaker point assembly.
7. Release the tension on the return springs and disconnect the springs. **Do not stretch the springs as distortion may result, making it impossible to obtain an adjustment. If the springs are distorted, discard them.**
8. Remove the distributor from the vise. Remove the distributor cap clamps.
9. Drive out the drive gear pin with a punch (Fig. 4).
10. If the gear and shaft are to be used again, mark the gear and shaft so that the pin holes can be easily aligned for assembly.

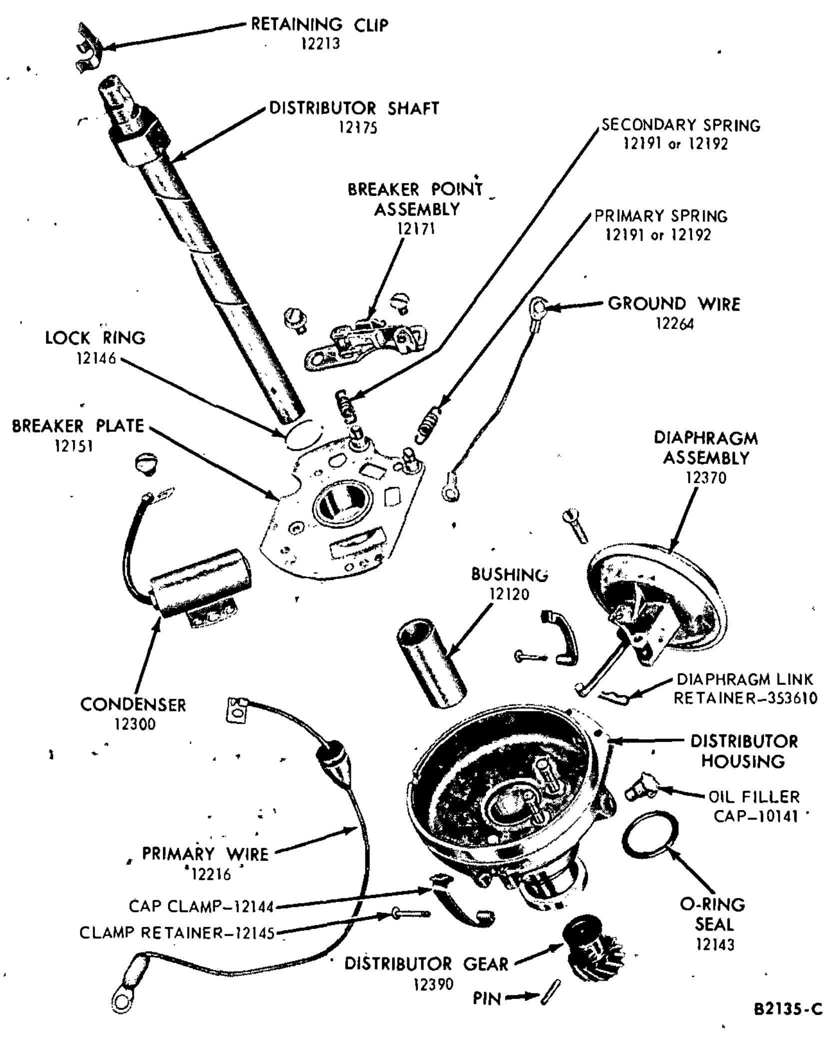


FIG. 3—Distributor Assembly

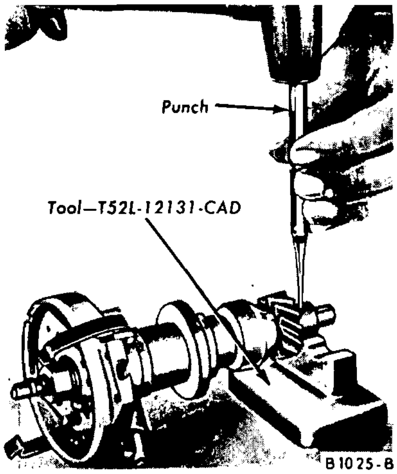


FIG. 4—Gear Pin Removal or Installation

11. Press the gear off the shaft (Fig. 5). Slide the distributor shaft out of the body.
12. Position the distributor in a vise.
13. Remove the lock ring attaching the breaker plate to the upper bushing. Lift the breaker plate from the body.
14. Remove the ground wire.
15. Remove the oil filler cap and the oil wick.
16. Compress and insert the slotted end of the bushing removal tool in the distributor body. Allow it to expand and butt against the bushing. Drive out the bushing (Fig. 6).

BENCH ASSEMBLY

1. Oil the bushing and position it in the body with the lock ring end up. Install the bushing (Fig. 7). Press the tool until the bushing bottoms firmly against the distributor body.
2. Burnish the bushing to the proper size (Fig. 8).
3. Install the ground wire. Position the breaker plate in the body. Install

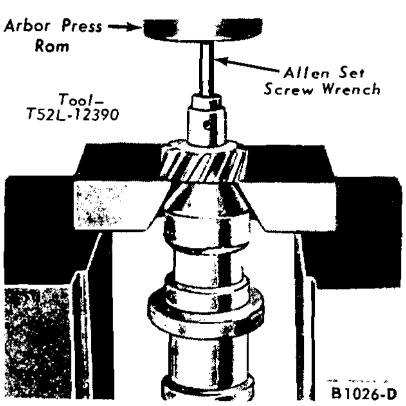


FIG. 5—Gear Removal

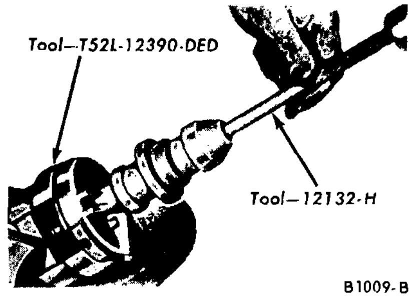


FIG. 6—Bushing Removal

the lock ring to secure the plate.
4. Position a new breaker point assembly on the breaker plate. Be sure the pivot pin enters the hole in the breaker plate.
5. Connect the ground wire under the breaker point screw at the end closest to the adjustment slot. Install the other screw and lock washer at the opposite end of the assembly.
6. Install a new condenser. Pass the primary wire assembly through the opening in the distributor, working from the inside to the outside of the distributor housing. Pull the wire through the opening until the locating stop is flush with the inside of the distributor. Place the condenser lead, primary lead, lock washer, and nut on the primary terminal.
7. Install the return springs on the adjustment and breaker plate posts. **Make certain that the primary spring is installed closest to the condenser.**
8. Install the vacuum diaphragm

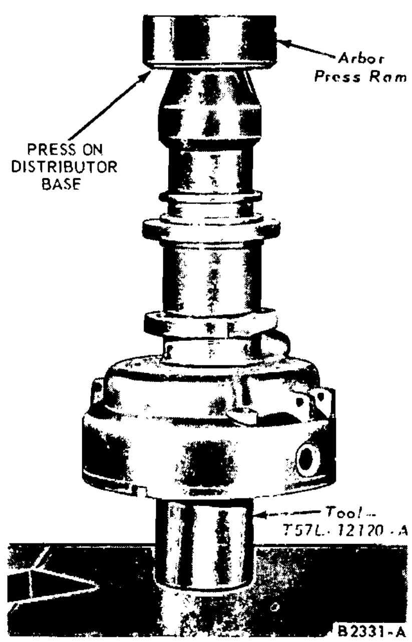


FIG. 7—Bushing Installation

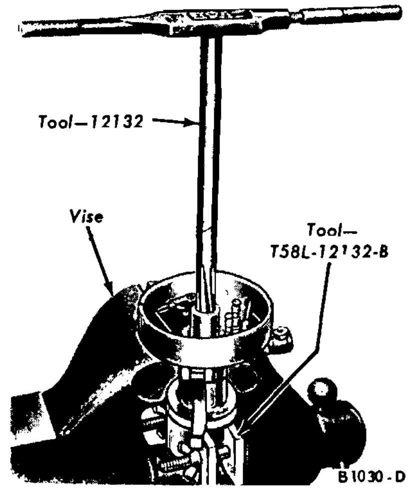


FIG. 8—Burnishing Bushing

on the distributor body.
9. Insert the tip of the vacuum diaphragm rod through the breaker plate. Attach the rod with the spring clip.
10. Slide the shaft into the body using care not to damage the rubbing block on the breaker points. **The shaft and gear are replaced as an assembly. One part should not be replaced without replacing the other.**
11. Place the distributor locating and installing fixture on the distributor. Place a 0.022 feeler gauge between the backing screw and the shaft. Tighten the backing screw enough to remove all shaft end play and remove the feeler gauge.
12. Place the spacer on the gear end of the shaft. Press the gear on the shaft (Fig. 9). If a new shaft is being installed, drill the shaft with a 1/8-inch drill using the pin hole in the gear shoulder as a guide.
13. Install the pin through the

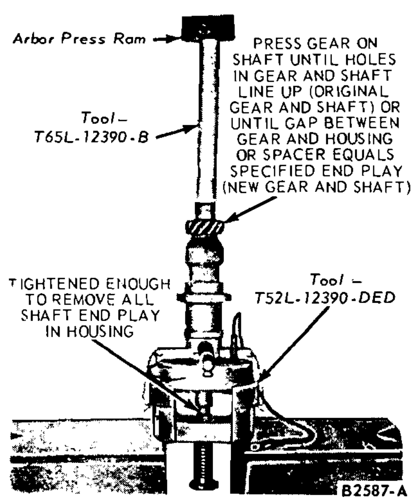


FIG. 9—Gear Installation

gear and shaft. Install the distributor cap clamps. Lubricate the cam with distributor cam lubricant.

14. Fill the oil reservoir with approximately 40 drops of engine oil. Install the oil wick and the filler cap.

15. Refer to Part 9-1 and adjust the breaker point spring tension, align the breaker points, and adjust the gap. Check the vacuum advance, and the breaker point dwell and resistance.

PART 9-3— *Dual Advance Distributors*

1 DESCRIPTION AND OPERATION

The dual advance distributor has two independently operated spark advance systems. A centrifugal advance mechanism is located below the stationary sub-plate assembly, and a vacuum operated spark control diaphragm is located on the side of the distributor base (Figs. 1 and 2). As speed increases, the centrifugal weights cause the cam to advance or move ahead with respect to the distributor drive shaft. The rate of advance is controlled by calibrated springs.

The vacuum advance mechanism has a spring-loaded diaphragm which is connected to the breaker plate. The spring-loaded side of the diaphragm is airtight and is connected through a vacuum line to the carburetor throttle bore. When the throttle plates open, the distributor vacuum passage is exposed to manifold vacuum, which causes the diaphragm to move against the tension of the spring. This action causes the movable breaker plate to pivot on the stationary sub-plate. The breaker point rubbing block, which is positioned on the opposite side of the cam from the pivot pin, then moves against distributor rotation and advances the spark timing. As the movable breaker plate is rotated from retard position to full advance position, the dwell decreases slightly. This is because the breaker point rubbing block and the cam rotate on different axes.

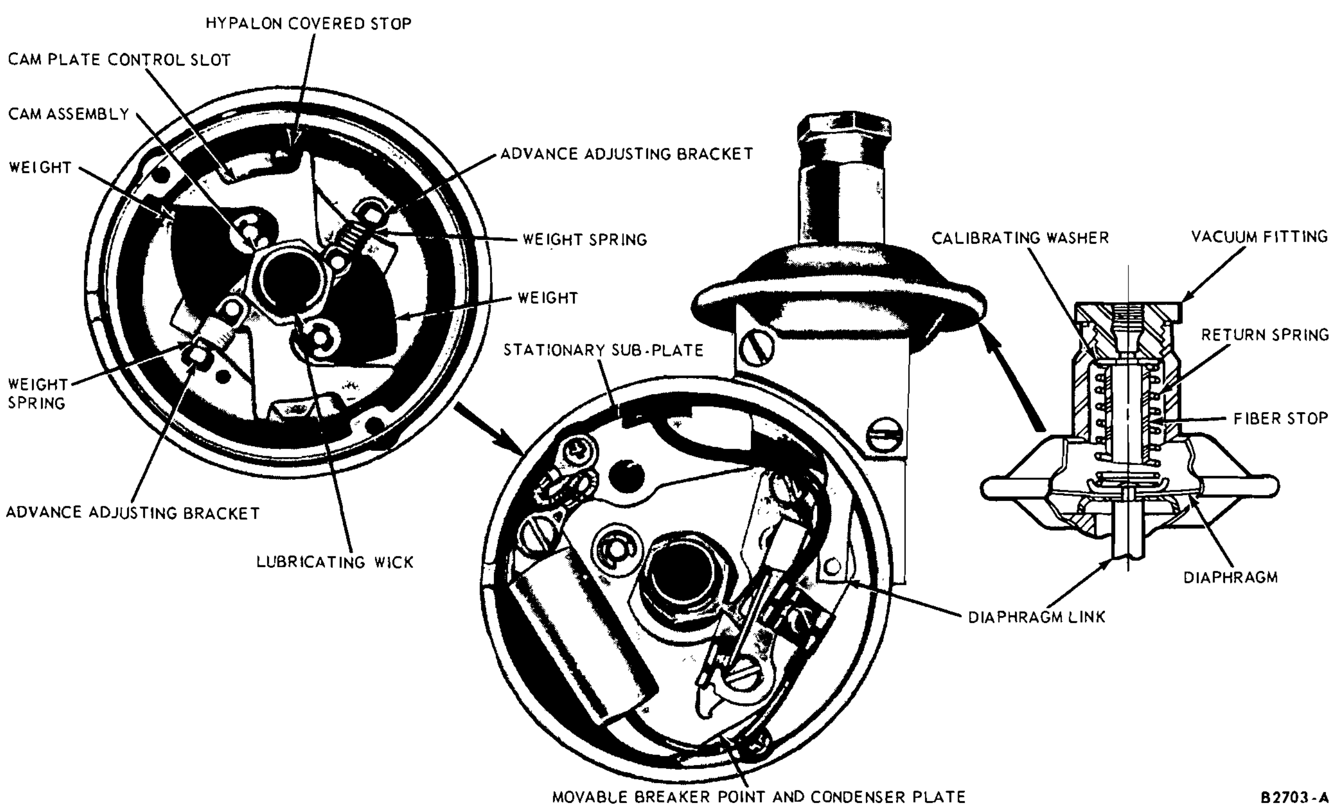


FIG. 1—Advance Mechanisms—Six Cylinder Engines.

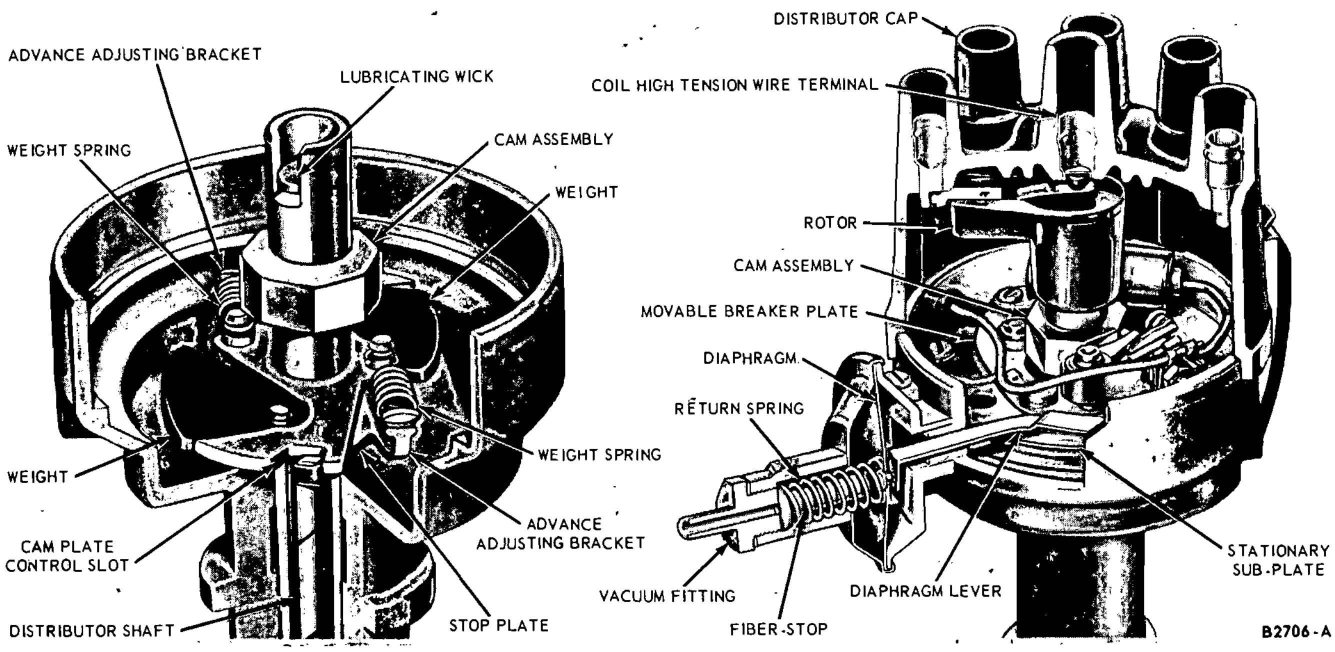


FIG. 2—Advance Mechanisms—V-8 Engines

2 IN-VEHICLE ADJUSTMENTS AND REPAIRS

BREAKER POINT AND CONDENSER REPLACEMENT

The replacement procedures are covered in Part 9-1, Section 2.

VACUUM DIAPHRAGM REPLACEMENT

REMOVAL

1. Remove the distributor cap and the rotor.
2. Remove the vacuum line from the diaphragm fitting.
3. Remove the spring clip that secures the diaphragm link to the movable breaker plate.
4. Remove the diaphragm retaining screws and slide the diaphragm out of the distributor.

INSTALLATION

1. Slide the diaphragm into the opening in the distributor and place the link in its position.
2. Install the spring clip that secures the diaphragm link to the movable breaker plate and the diaphragm retaining screws.
3. Install the vacuum line on the diaphragm fitting.
4. Install the rotor and the distributor cap.

BREAKER PLATE AND SUB-PLATE REPLACEMENT

Refer to Figs. 3, 4, and 5 for the proper location of parts.

REMOVAL

1. Remove the distributor cap and the rotor.

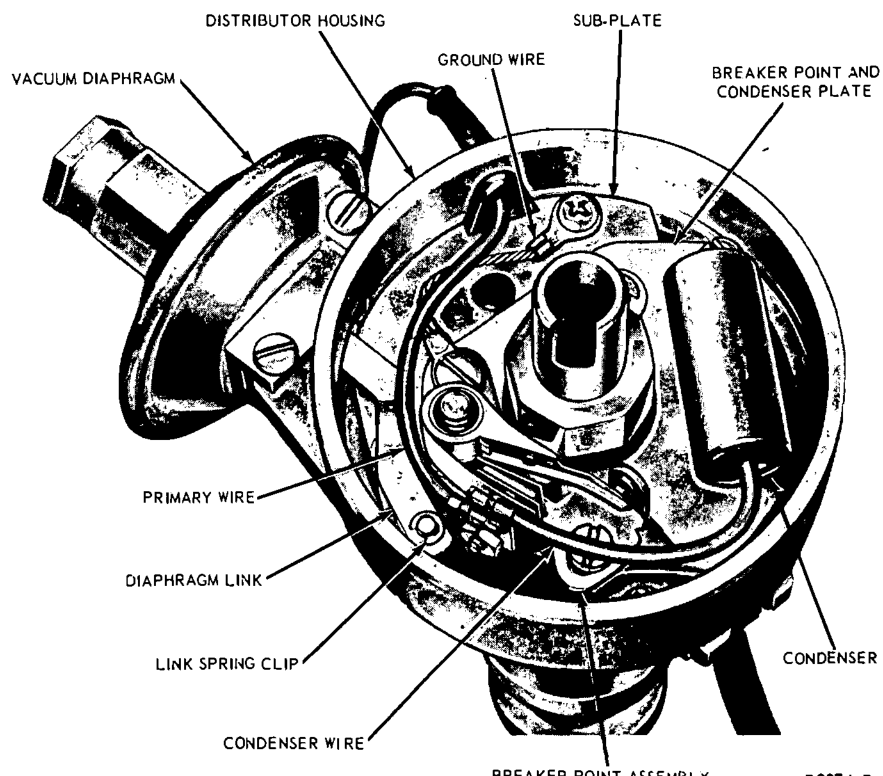


FIG. 3—Breaker Plate Installed—Pivot-Type Points V-8 Engines

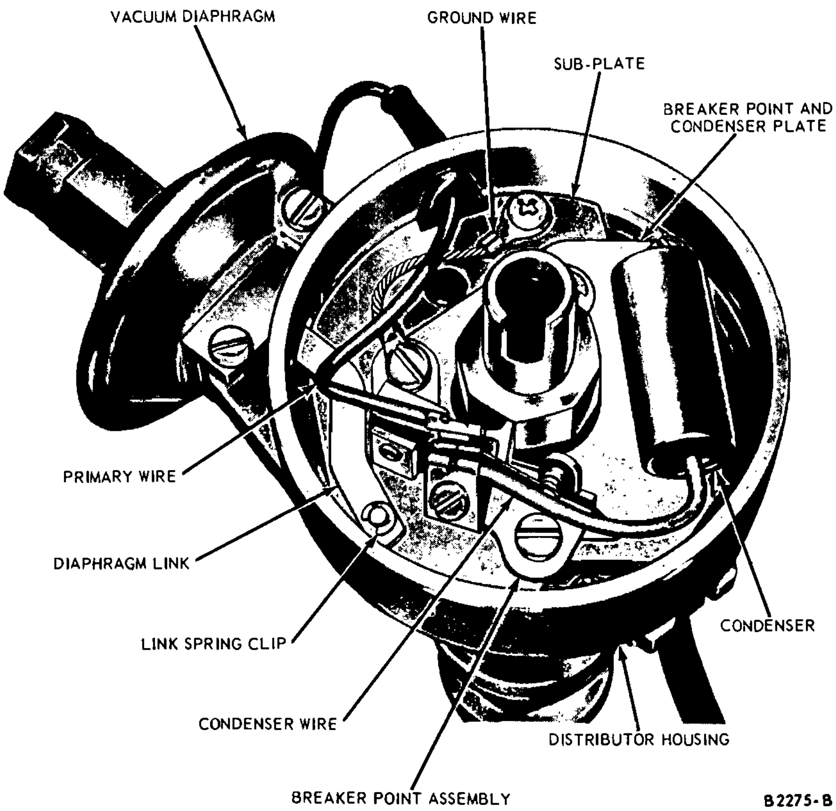


FIG. 4—Breaker Plate Installed—Pivotless Points V-8 Engines

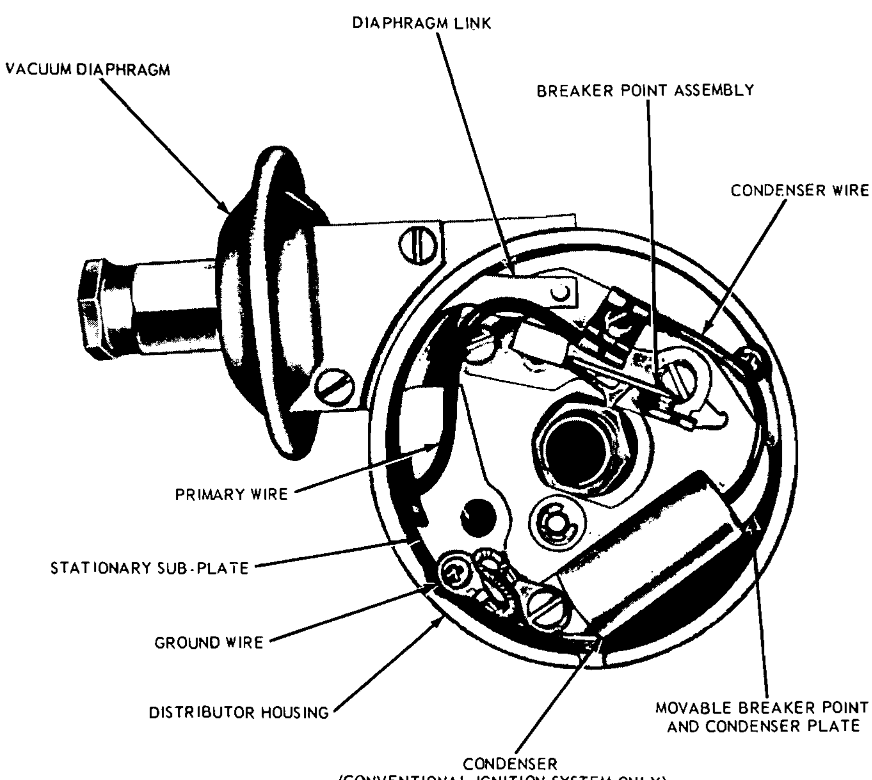


FIG. 5—Breaker Plate Installed—Six Cylinder Engines

2. Remove the breaker point assembly, the condenser, and the vacuum diaphragm.
3. Working from the inside of the distributor, pull the primary wire through the opening in the distributor.
4. Remove the spring clip, the flat washer, and the spring washer securing the breaker plate to the sub-plate.
5. Remove the sub-plate retaining screws and lift both plates out of the distributor.

INSTALLATION

1. Place the breaker plate in position on the sub-plate.
2. Install the spring washer, the flat washer, and the spring clip that secures the breaker plate to the sub-plate.
3. Install the sub-plate hold down screws (the ground wire should be under the sub-plate hold down screw near the primary wire opening in the distributor).
4. Working from the inside of the distributor, push the primary wire through the opening in the distributor.
5. Install the breaker point assembly, the condenser and the vacuum diaphragm.
6. Install the rotor and the distributor cap.

CAM AND CENTRIFUGAL ADVANCE MECHANISM REPLACEMENT

REMOVAL

1. Remove the distributor cap and the rotor.
2. Working from the inside of the distributor, pull the primary wire through the opening in the distributor.
3. Remove the sub-plate retaining screws and lift the plate assembly out of the distributor.
4. **Mark one of the distributor weight springs and its brackets. Also mark one of the weights and its pivot pin.**
5. Carefully unhook and remove the weight springs.
6. Lift the lubricating wick from the cam assembly. Remove the cam assembly retainer and lift the cam assembly off the distributor shaft. Remove the thrust washer.
7. If replacing the weights, remove the weight retainers and lift the weights out of the distributor.

INSTALLATION

1. If the weights were removed, fill

the grooves in the weight pivot pins with distributor cam lubricant (C4AZ-19D530-A).

2. Position the weights in the distributor (**the marked weight is placed on the marked pivot pin**) and install the weight retainers.

3. Place the thrust washer on the shaft.

4. Fill the grooves in the upper portion of the distributor shaft with distributor cam lubricant (C4AZ-19D530-A).

5. Install the cam assembly. **Be sure that the marked spring bracket on the cam assembly is near the marked spring bracket on the stop plate.**

If a new cam is being installed, make sure that the cam is installed with the hypalon covered stop in the correct cam plate control slot. This can be done by measuring the length of the slot used on the old cam and by using the corresponding slot on the new cam. Some of the cams will have the size of the slot in degrees stamped near the slot. **If the wrong slot is used, an incorrect maximum advance will be obtained.**

Place a light film of distributor cam lubricant on the distributor cam lobes. Install the retainer and the wick. Saturate the wick with SAE 10W engine oil.

6. Install the weight springs. **Be sure that the marked spring is attached to the marked spring brackets.**

7. Install the sub-plate assembly.

8. Working from the inside of the distributor, push the primary wire through the opening in the distributor.

9. Install the rotor and the distributor cap.

ADJUSTMENTS

Refer to Part 9-1, Section 2 for the adjustment procedures.

3 REMOVAL AND INSTALLATION

REMOVAL

1. Disconnect the primary wire at the coil. Disconnect the vacuum advance line at the distributor. Remove the distributor cap.

2. Scribe a mark on the distributor body and engine block indicating the position of the body in the block, and scribe another mark on the distributor body indicating the position of the rotor. These marks can be used as guides when installing the distributor in a correctly timed engine.

3. Remove the distributor hold down bolt and clamp. Lift the distributor out of the block.

Do not rotate the crankshaft while the distributor is removed, or it will be necessary to time the engine.

INSTALLATION

1. If the crankshaft was rotated while the distributor was removed from the engine, it will be necessary to time the engine. Rotate the crankshaft until No. 1 piston is on TDC after the compression stroke. Align the TDC mark on the timing pointer with the timing pin on the crankshaft damper. Position the distributor in the block with the rotor at the No. 1 firing position.

Make sure the oil pump intermediate shaft properly engages the distributor shaft. It may be necessary to crank the engine with the starter, after the distributor drive gear is partially engaged, in order to engage the oil pump intermediate shaft.

Install, but do not tighten, the retaining clamp and bolt. Rotate the distributor body counterclockwise until the breaker points are just starting to open. Tighten the clamp.

2. If the crankshaft has not been rotated, position the distributor in the block with the rotor aligned with the mark previously scribed on the distributor body, and the marks on the distributor body and engine block in alignment. Install the retaining clamp.

3. Install the distributor cap.

4. Connect the primary wire to the coil.

5. Check the ignition timing with a timing light and adjust to specifications if necessary. Connect the vacuum line, and check the advance with the timing light when the engine is accelerated.

4 MAJOR REPAIR OPERATIONS

To perform the operations in this section, it will be necessary to remove the distributor from the engine and place it in a vise.

BENCH DISASSEMBLY

The distributor assembly is shown in Fig. 6 and 7.

1. Remove the rotor.

2. Disconnect the primary and the condenser wires from the breaker point assembly.

3. Remove the breaker point assembly and condenser retaining screws. Lift the breaker point assembly and condenser out of the distributor.

4. Remove the spring clip that secures the diaphragm link to the moveable breaker plate.

5. Remove the diaphragm retaining screws and slide the diaphragm out of the distributor.

6. Working from the inside of the distributor, pull the primary wire through the opening in the distributor.

7. Remove the spring clip, the flat washer, and the spring washer securing the breaker plate to the sub-plate.

8. Remove the sub-plate retaining screws and lift both plates out of the distributor.

9. **Mark one of the distributor weight springs and its brackets. Also mark one of the weights and its pivot pin.**

10. Carefully unhook and remove the weight springs.

11. Lift the lubricating wick from the cam assembly. Remove the cam assembly retainer and lift the cam assembly off the distributor shaft. Remove the thrust washer.

12. Remove the weight retainers and lift the weights out of the distributor.

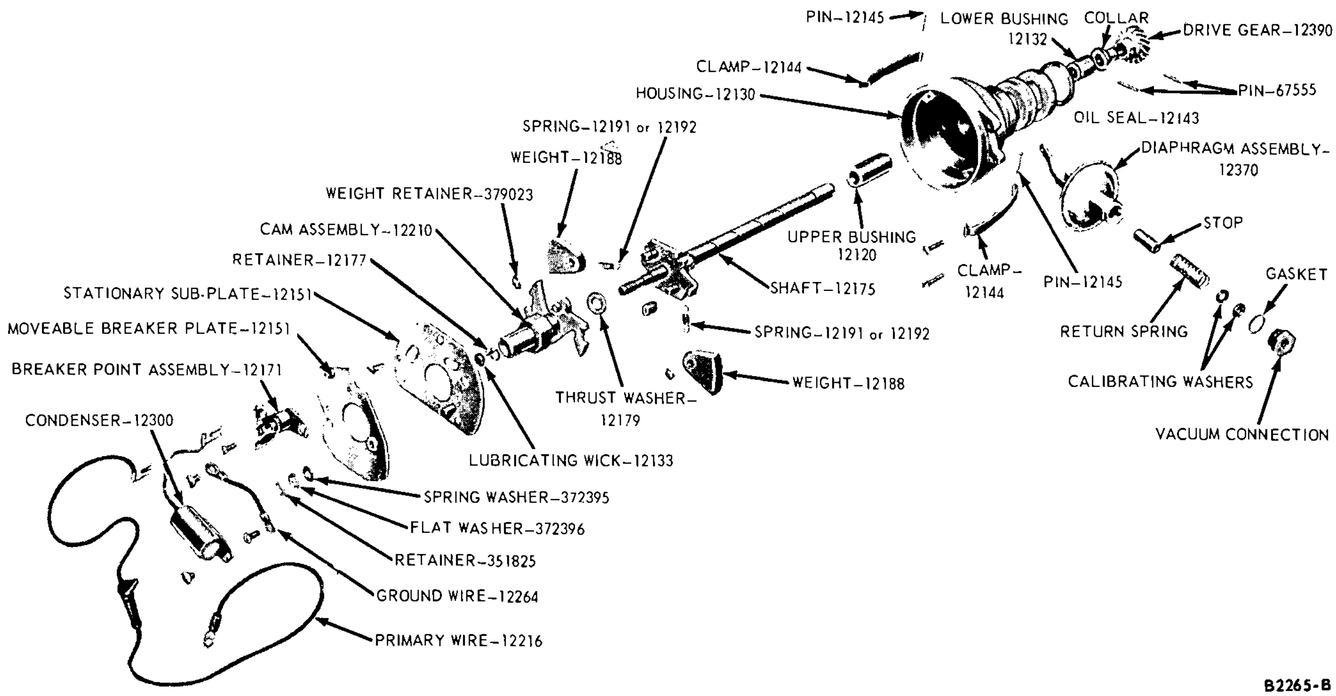


FIG. 6— Distributor Assembly V-8 Engines

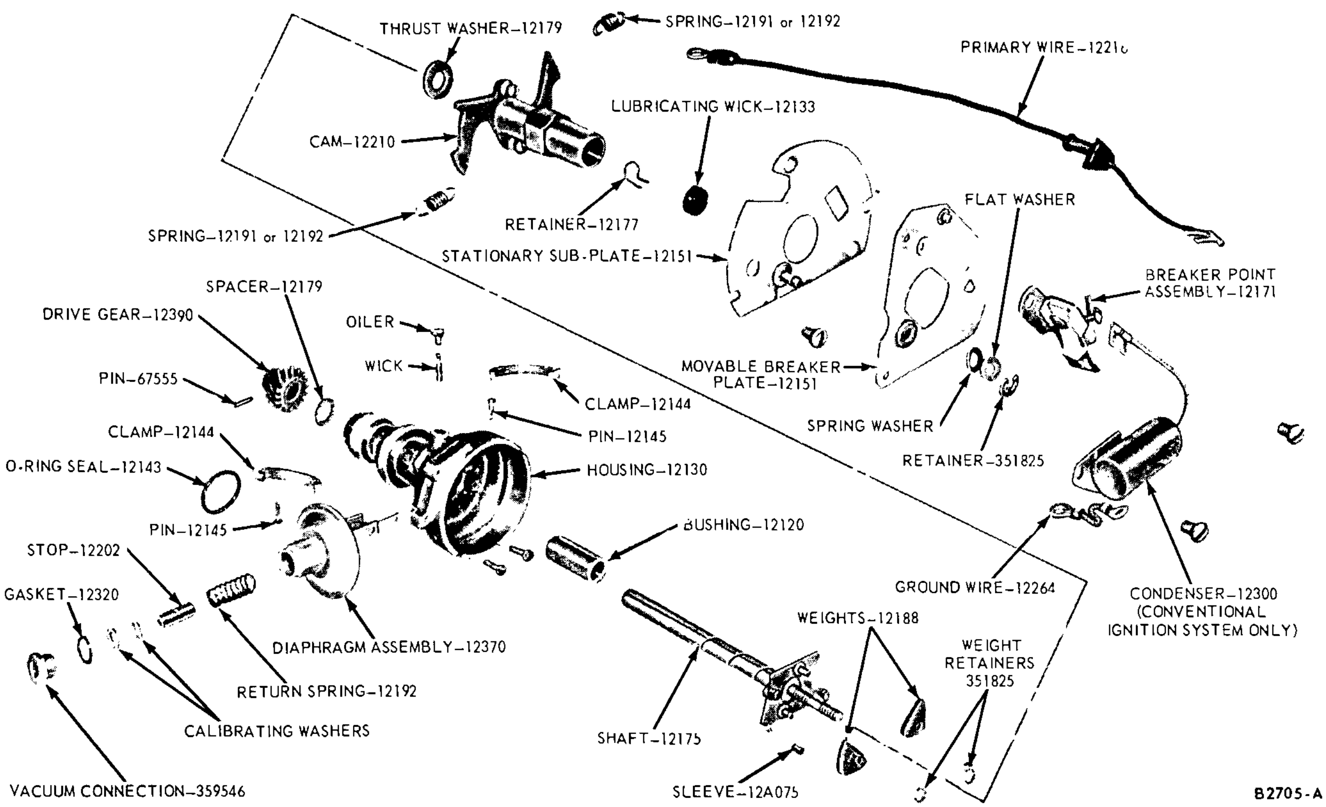


FIG. 7— Distributor Assembly Six Cylinder Engines

13. Remove the distributor cap clamps.

14. If the gear and shaft are to be used again, mark the gear and the shaft so that the pin holes can be easily aligned for assembly. Remove the gear roll pin (Fig. 8), and then remove the gear (Fig. 9).

15. Remove the shaft collar roll pin (Fig. 10).

16. Invert the distributor and place it on a support plate in a position that will allow the distributor shaft to clear the support plate and press the shaft out of the collar and the

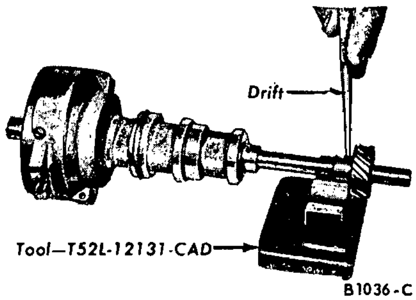


FIG. 8—Gear Pin Removal or Installation— Typical

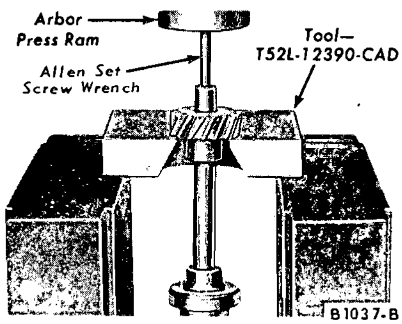


FIG. 9—Gear Removal

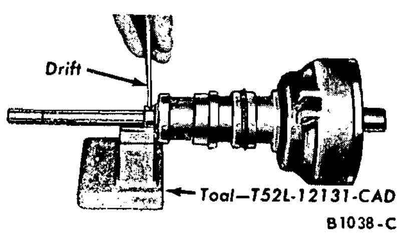


FIG. 10—Collar Pin Removal or Installation

distributor housing (Fig. 11).

17. Refer to Figs. 12 and 13 and remove the distributor shaft upper and lower bushings.

BENCH ASSEMBLY

ORIGINAL SHAFT AND GEAR

1. Oil the new upper bushing, and position it on the bushing replacer tool. Install the bushing (Fig. 14). When the tool bottoms against the distributor base, the bushing will be installed to the correct depth.

2. Burn the bushing to the proper size (Fig. 15).

3. Invert the distributor and install and burnish the lower bushing in a similar manner.

4. Oil the shaft and slide it into the distributor body.

5. Place the collar in position on

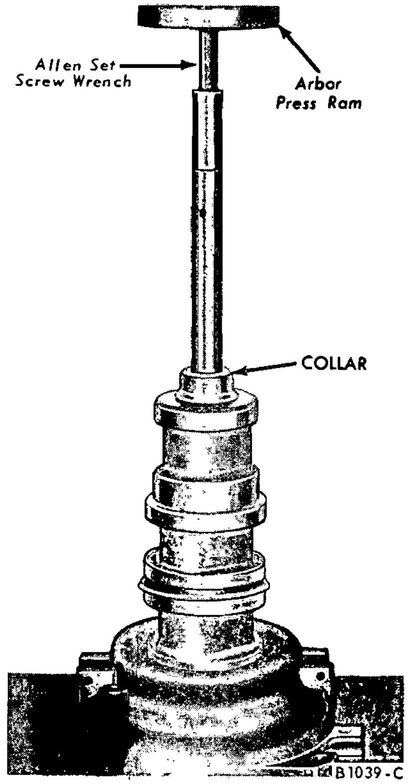


FIG. 11—Shaft Removal

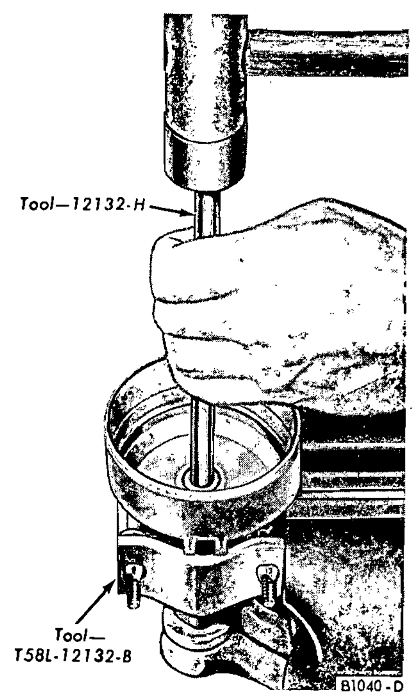


FIG. 12—Lower Bushing Removal—Typical

the shaft and align the holes in the collar and the shaft, then install a new pin. Install the distributor cap clamps.

6. Check the shaft end play with a feeler gauge placed between the collar and the base of the distributor.

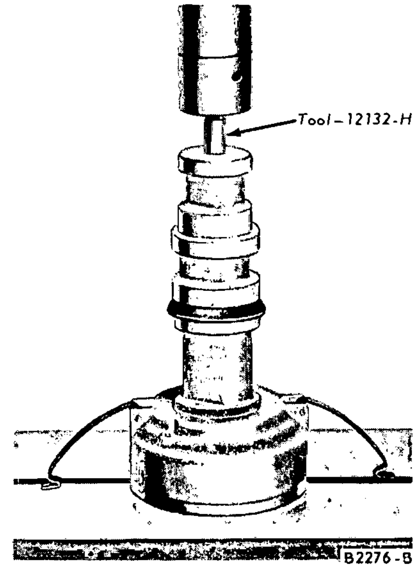


FIG. 13—Upper Bushing Removal—Typical

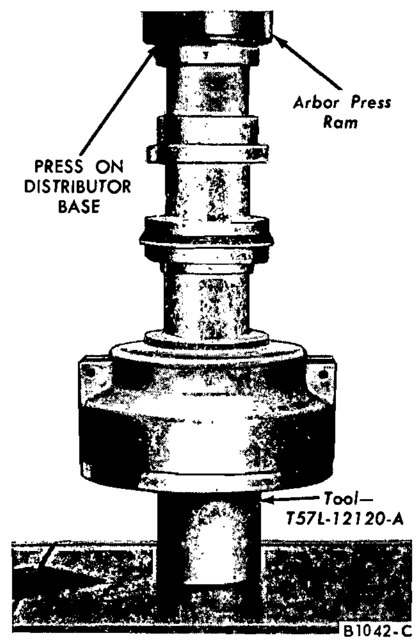


FIG. 14—Upper Bushing Installation

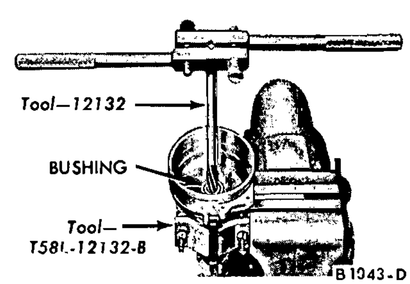


FIG. 15—Burnishing Bushing

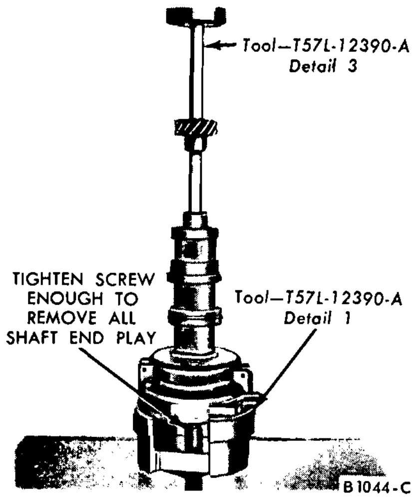


FIG. 16—Original Shaft and Gear Installation

If the end play is not within specifications, replace the shaft and gear.

7. Attach the distributor shaft supporting tool to the distributor. Tighten the backing screw in the tool enough to remove all shaft end play.

8. Install the assembly in a press. Press the gear on the shaft (Fig. 16), using the marks made on the gear and shaft as guides to align the pin holes.

9. Remove the distributor from the press. Install the gear retaining pin (Fig. 6).

10. Position the distributor in a vise. Fill the grooves in the weight pivot pins with a distributor cam lubricant.

11. Position the weights in the distributor (the marked weight is placed on the marked pivot pin) and install the weight retainers.

12. Place the thrust washer on the shaft.

13. Fill the grooves in the upper portion of the distributor shaft with distributor cam lubricant (C4AZ-19D530-A).

14. Install the cam assembly. **Be sure that the marked spring bracket on the cam assembly is near the marked spring bracket on the stop plate.**

If a new cam is being installed, make sure that the cam is installed with the hypalon covered stop in the correct cam plate control slot. This can be done by measuring the length of the slot used on the old cam and by using the corresponding slot on the new cam. Some of the cams will have the size of the slot in degrees stamped near the slot. **If the wrong slot is used, an incorrect maximum advance will be obtained.**

Place a light film of distributor cam lubricant on the distributor cam lobes. Install the retainer and the wick. Saturate the wick with SAE 10W engine oil.

15. Install the weight springs. **Be sure that the marked spring is attached to the marked spring brackets.**

16. Place the breaker plate in position on the sub-plate.

17. Install the spring washer, the flat washer, and the spring clip that secures the breaker plate to the sub-plate.

18. Install the sub-plate hold down screws (the ground wire should be under the sub-plate hold down screw near the primary wire opening in the distributor).

19. Working from the inside of the distributor, push the primary wire through the opening in distributor.

20. Slide the diaphragm into the opening in the distributor and place the link in its position.

21. Install the spring clip that secures the diaphragm link to the moveable breaker plate.

22. Place the breaker point assembly and the condenser in position and install the retaining screws. Be sure to place the ground wire under the breaker point assembly screw farthest from the breaker point contacts. Align and adjust the breaker point assembly by following the procedure in Part 9-1.

23. Connect the primary and condenser leads to the breaker point assembly.

24. Install the rotor and the distributor cap.

25. Check and adjust (if necessary) the centrifugal and vacuum advance (Refer to Part 9-1, Section 1).

NEW SHAFT AND GEAR —SIX-CYLINDER ENGINES

The shaft and gear are replaced as an assembly. One part should not be replaced without replacing the other. Refer to Fig. 4 for the correct location of the parts.

1. Follow steps 1, 2, and 3 under Installing Original Shaft and Gear.

2. Attach the distributor shaft supporting tool to the distributor and install the assembly in a vise. Insert a 0.003 inch feeler gauge between the backing screw and the shaft. Tighten the backing screw on the tool enough to remove all shaft end play. Remove the feeler gauge and allow the shaft to rest on the backing screw. Place the gear thrust washer in position. Press the gear on the shaft until it bottoms on the gear thrust washer (Fig. 17). Drill a 1/8 inch hole through the shaft using the access opening in the gear as a pilot.

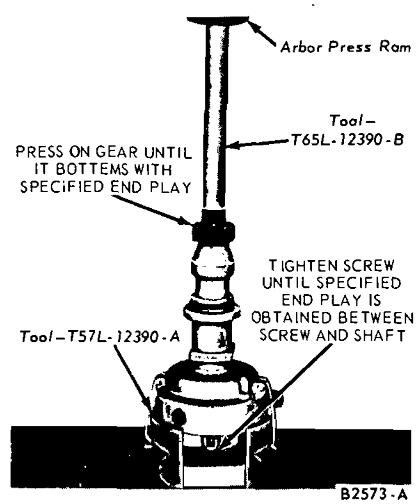


FIG. 17—New Shaft and Gear Installation

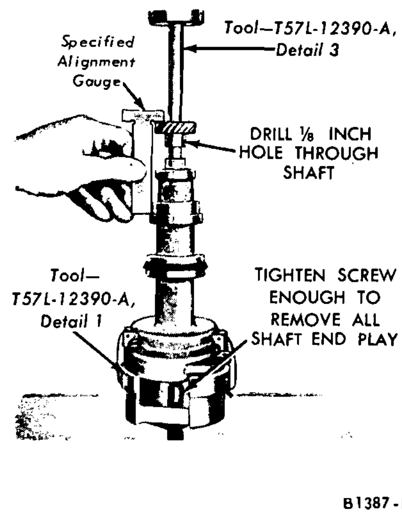


FIG. 18—New shaft and Gear Installation—V-8 Engines

3. Remove the distributor from the press and remove the support tool. Install the gear retaining pin (Fig. 8).

4. Complete the assembly by following steps 8 thru 23 under Installing Original Shaft and Gear.

NEW SHAFT AND GEAR —V-8 ENGINES

The shaft and gear are replaced as an assembly. One part should not be replaced without replacing the other. Refer to Fig. 5 for the correct location of the parts.

1. Follow steps 1, 2, 3, and 4 under "Installing Original Shaft and Gear -Conventional Ignition System Distributor."

2. Attach the distributor shaft supporting tool to the distributor and install the assembly in a vise. Insert

a 0.024-inch feeler gauge between the backing screw and the shaft. Tighten the backing screw on the tool enough to remove all shaft end play. Remove the feeler gauge and allow the shaft to rest on the backing screw. Slide the collar on the shaft. While holding the collar in place against the distributor base (Fig. 18), drill a 1/8-inch hole through the shaft using the access opening in the collar as a pilot.

3. Position the gear on the end of the shaft. Install the assembly in a press.

4. With the backing screw on the support tool tightened enough to remove all end play, press the gear on the shaft to the specified distance from the bottom face of the gear to the bottom face of the distributor mounting flange (Fig. 18). Drill a 1/8-inch hole through the shaft using the hole in the gear as a pilot.

5. Remove the distributor from the press and remove the support tool. Install the collar retaining pin (Fig. 8) and the gear retaining pin (Fig. 6).

6. Complete the assembly by following steps 9 thru 25 under Installing Original Shaft and Gear.

PART 9-4— Centrifugal Advance Distributors

1 DESCRIPTION AND OPERATION

The centrifugal advance distributor is a straight mechanical-type unit. A governor-type centrifugal advance is located below the stationary breaker plate (Fig. 1). Two centrifugal weights cause the cam to advance or move ahead with respect to the distributor drive shaft the rate of advance is controlled by two calibrated springs.

The conventional ignition system distributor has dual breaker points. The breaker points are located on the stationary breaker plate and are connected in parallel with an insulated jumper strap. One breaker point assembly closes the primary circuit and the other opens the primary circuit. This type of construction results in a greater amount of dwell with approximately the same amount of gap spacing as the single breaker point distributor. The breaker arm spring tension is greater than on the loadomatic or dual advance distributors. This increased dwell and breaker arm spring tension assures reserve spark plug voltage for high speed performance.

On a transistorized ignition system distributor, there is only one set of breaker points. The transistorized ignition system distributor also has a dust cover but no condenser.

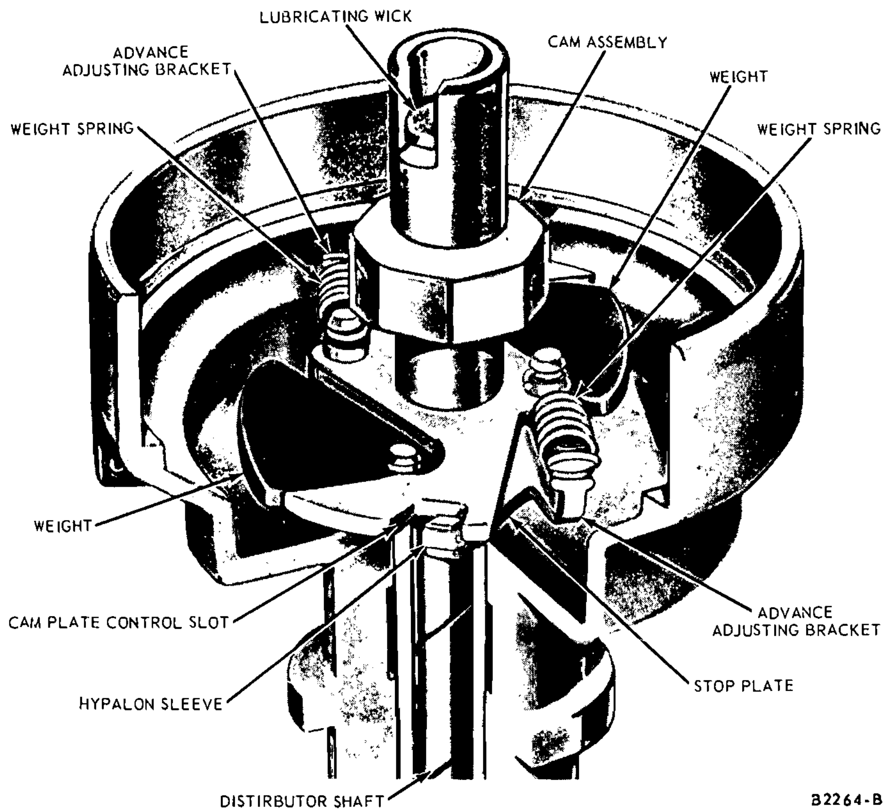


FIG. 1— Centrifugal Advance Mechanism

2 IN-VEHICLE ADJUSTMENTS AND REPAIRS

BREAKER POINT AND CONDENSER REPLACEMENT

The replacement procedures are covered in Part 9-1, Section 2.

CONVENTIONAL IGNITION SYSTEM DISTRIBUTOR

Removal

1. Remove the distributor cap and the rotor.

2. Remove the breaker point assemblies and the condenser.

3. Working from the inside of the distributor, pull the primary wire through the opening in the distributor.

4. Remove the breaker point and condenser plate retaining screws and lift the plate out of the distributor.

Installation

The breaker point and condenser plate assembly installation is shown in Fig. 2.

1. Place the breaker point and condenser plate in position and install the retaining screws.

2. Working from the inside of the distributor, push the primary wire through the opening in the distributor housing.

3. Install the breaker point assemblies and the condenser.

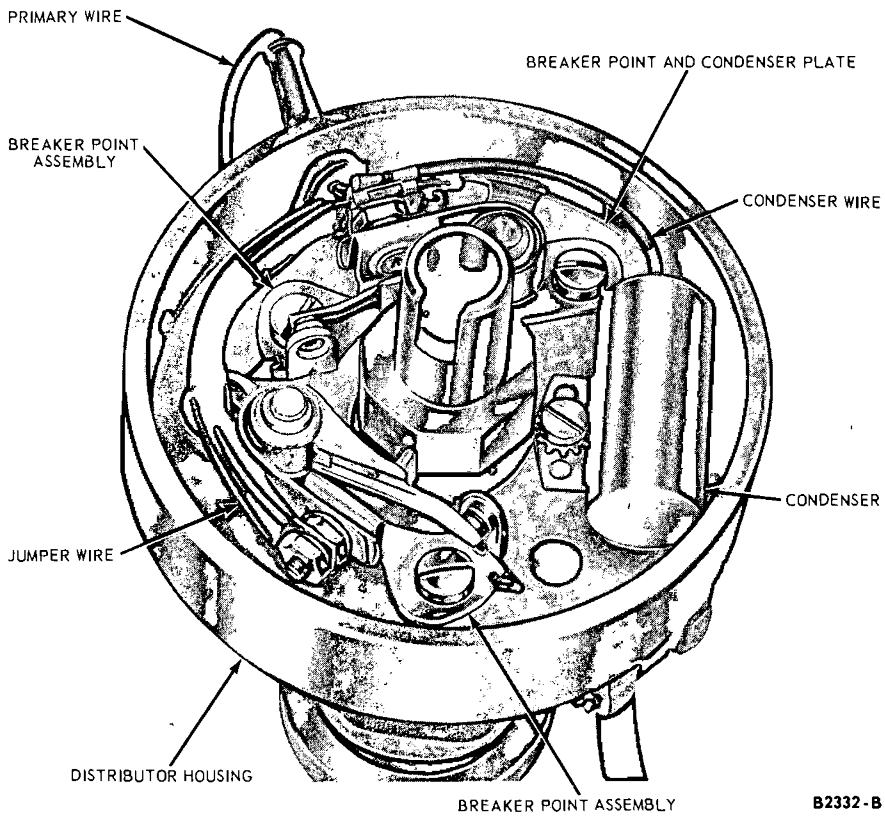


FIG. 2—**Breaker Plate Installed— Conventional Ignition System**

4. Install the rotor and the distributor cap.

TRANSISTOR IGNITION SYSTEM DISTRIBUTOR

Removal

1. Remove the distributor cap, the rotor, the dust cover, and the breaker point assembly.
2. Working from the inside of the distributor, pull the distributor-transistor lead through the opening in the distributor.
3. Remove the breaker point and condenser plate retaining screws and lift the plate out of the distributor.

Installation

1. Place the breaker point and condenser plate in position and install the retaining screws.
2. Working from the inside of the distributor, push the distributor transistor wire through the opening in the distributor housing.
3. Install the breaker point assembly, the dust cover, the rotor, and the distributor cap.

CAM AND CENTRIFUGAL ADVANCE MECHANISM REPLACEMENT

CONVENTIONAL AND TRANSISTOR IGNITION SYSTEM DISTRIBUTORS

Removal

1. Remove the distributor cap, the rotor, and the dust cover (if so equipped).
2. Working from the inside of the distributor, pull the primary wire through the opening in the distributor.
3. Remove the breaker point and condenser plate retaining screws and lift the plate assembly out of the distributor.
4. **Mark one of the distributor weight springs and its brackets. Also mark one of the weights and its pivot pin.**
5. Carefully unhook and remove the weight springs.
6. Lift the lubricating wick from the cam assembly. Remove the cam assembly retainer and lift the cam assembly off the distributor shaft. Remove the thrust washer.
7. Remove the weight retainers and lift the weights out of the distributor.

Installation

1. Fill the grooves in the weight pivot pins with distributor cam lubricant (C4AZ-19D530-A).
2. Position the weights in the distributor (**the marked weight is placed on the marked pivot pin**) and install the weight retainers.
3. Place the thrust washer on the shaft.
4. Fill the grooves in the upper portion of the distributor shaft with distributor cam lubricant (C4AZ-19D530-A).
5. Install the cam assembly. **Be sure that the marked spring bracket on the cam assembly is near the marked spring bracket on the stop plate.**

If a new cam assembly is being installed, make sure that the cam is installed with the hypalon covered stop in the correct cam plate control slot. This can be done by measuring the length of the slot used on the old cam and by using the corresponding slot on the new cam. Some of the cams will have the size of the slot in degrees stamped near the slot. **If the wrong slot is used, an incorrect maximum advance will be obtained.**

Place a light film of distributor cam lubricant (C4AZ-19D530-A) on the distributor cam lobes. Install the retainer and the wick. Saturate the wick with SAE 10W engine oil.

6. Install the weight springs. **Be sure that the marked spring is attached to the marked spring brackets.**
7. Install the breaker point and condenser plate assembly.
8. Working from the inside of the distributor, push the primary wire through the opening in the distributor.
9. Install the dust cover (if so equipped), the rotor, and the distributor cap.

ADJUSTMENTS

Refer to Part 9-1, Section 3 for the adjustment procedures.

3 REMOVAL AND INSTALLATION

REMOVAL

1. Disconnect the primary wire at the coil or the distributor-transistor wire at the quick disconnect. Remove the distributor cap.

2. Scribe a mark on the distributor body and engine block indicating the position of the body in the block, and scribe another mark in the distributor body indicating the position of the rotor. The marks can be used as guides when installing the distributor in a correctly timed engine.

3. Remove the distributor hold down cap bolt and clamp, and then lift the distributor out of the block.

Do not rotate the crankshaft while the distributor is removed, or it will be necessary to time the engine.

INSTALLATION

1. If the crankshaft was rotated while the distributor was removed from the engine, it will be necessary to time the engine. Rotate the crankshaft until No. 1 piston is on TDC (after the compression stroke). Align the TDC mark on the timing pointer with the timing pin on the crankshaft damper. Position the distributor in the block with the rotor at the No. 1 firing position.

If the crankshaft has not been rotated, position the distributor in the block with rotor aligned with the mark previously scribed on the distributor body, and the marks on the distributor body and engine block in alignment. Install the retaining clamp.

Make sure the oil pump intermediate shaft properly engages the distributor shaft. It may be necessary to crank the engine with the starter, after the distributor drive gear is partially engaged, in order to engage the oil pump intermediate shaft.

2. Install, but do not tighten, the retaining clamp and bolt. Rotate the distributor body counterclockwise until one set of breaker points are just starting to open. Tighten the clamp.

3. Install the distributor cap.

4. Connect the primary wire to the coil or the distributor-transistor lead wire to the quick disconnect.

5. Check the ignition timing with a timing light and adjust it if necessary.

4 MAJOR REPAIR OPERATIONS

To perform the operations in this section, it will be necessary to remove the distributor from the car and place it in a vise.

BENCH DISASSEMBLY

Refer to Figs. 3 and 4 for the location of parts.

CONVENTIONAL IGNITION SYSTEM DISTRIBUTOR

1. Remove the rotor.

2. Disconnect the primary wire, the jumper strap, and the condenser wire from the breaker point assemblies.

3. Remove the retaining screws from the breaker point assemblies and condenser. Lift the breaker point assemblies and the condenser out of the distributor.

4. Working from the inside of the distributor, pull the primary wire through the opening in the distributor.

5. Remove the breaker point and

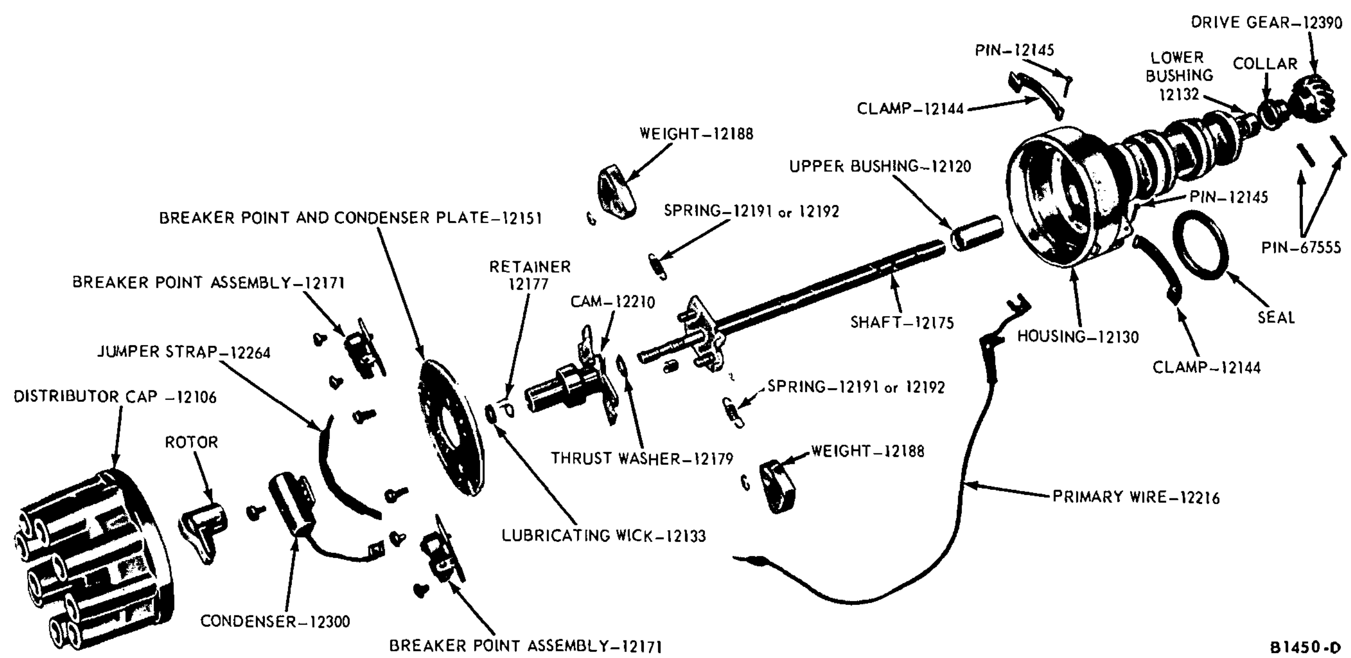


FIG. 3—Distributor Assembly (Conventional)

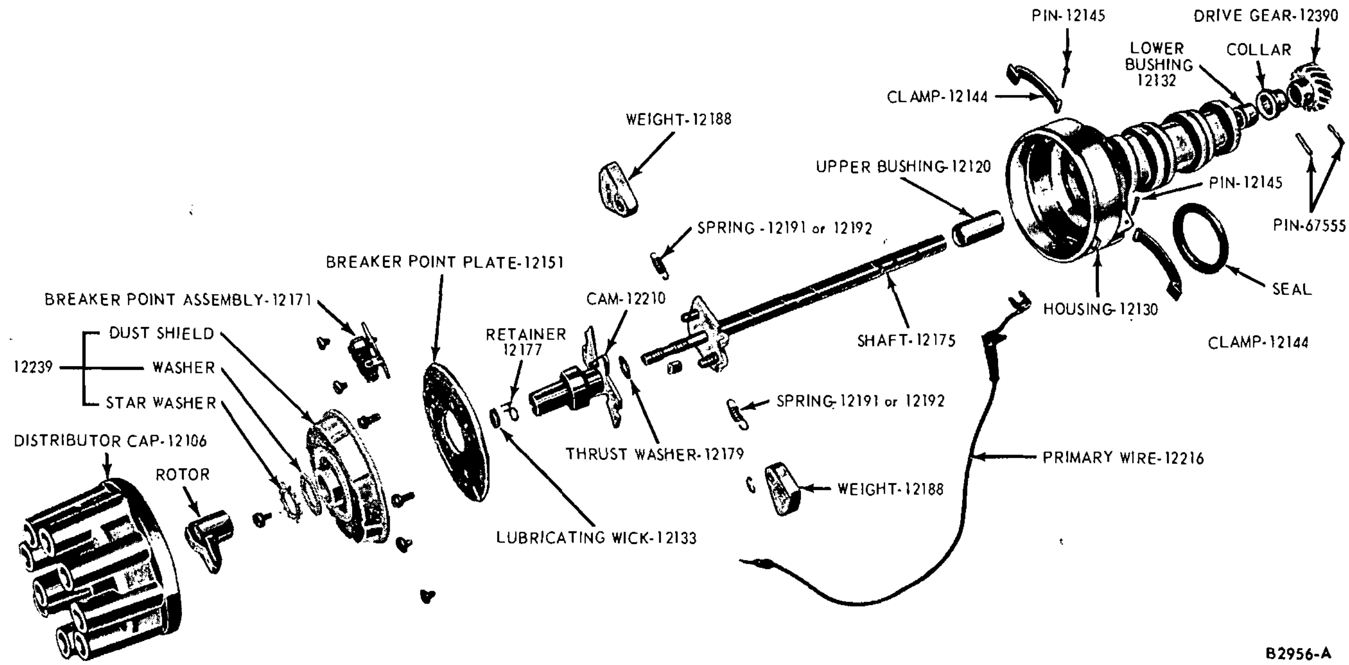


FIG. 4—Distributor Assembly (Transistor Ignition)

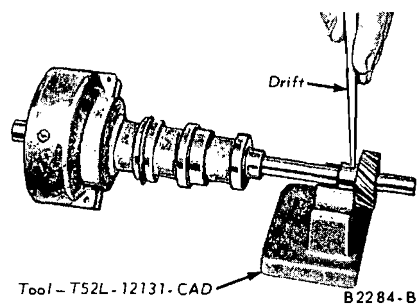


FIG. 5—Gear Pin Removal or Installation

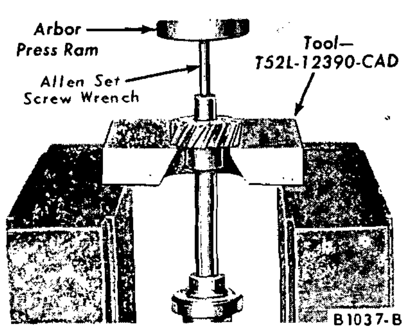


FIG. 6—Gear Removal

condenser plate retaining screws and lift the plate out of the distributor.

6. Mark one of the distributor weight springs and its brackets. Also mark one of the weights and its pivot pin.

7. Carefully unhook and remove the weight springs.

8. Lift the lubricating wick from the cam assembly. Remove the cam

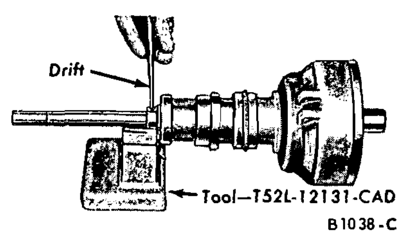


FIG. 7—Collar Pin Removal or Installation

assembly retainer and lift the cam assembly off the distributor shaft. Remove the thrust washer.

9. Remove the weight retainers and lift the weights out of the distributor.

10. Remove the distributor cap clamps.

11. If the gear and shaft are to be used again, mark the gear and the shaft so that the pin holes can be easily aligned for assembly. Remove the gear roll pin (Fig. 5), and then remove the gear. (Fig. 6).

12. Remove the shaft collar roll pin (Fig. 7).

13. Invert the distributor and place it on a support in a position that will allow the distributor shaft to clear the support plate and press the shaft out of the collar and the distributor housing (Fig. 8).

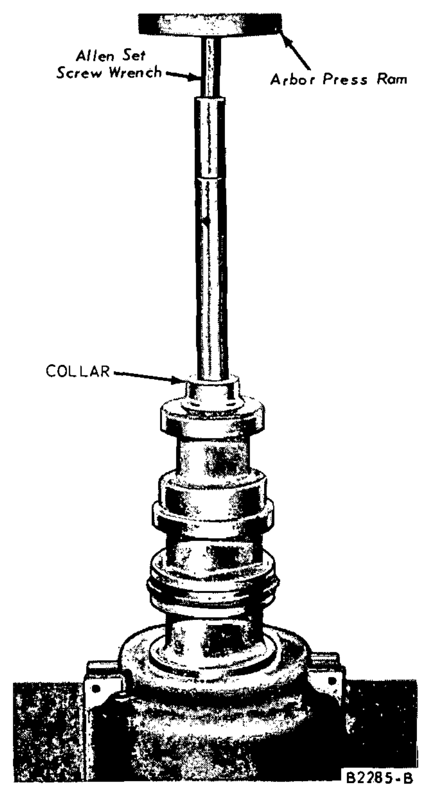


FIG. 8—Shaft Removal

14. Remove the distributor shaft upper bushing (Fig. 9).

15. Remove the distributor shaft lower bushing (Fig. 10).

TRANSISTOR IGNITION SYSTEM DISTRIBUTOR

1. Remove the rotor and the dust cover.

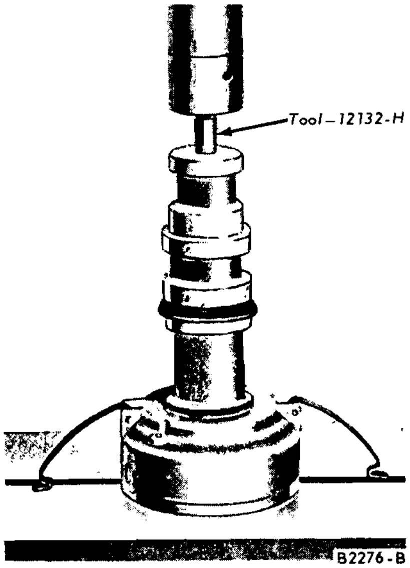


FIG. 9— Upper Bushing Removal

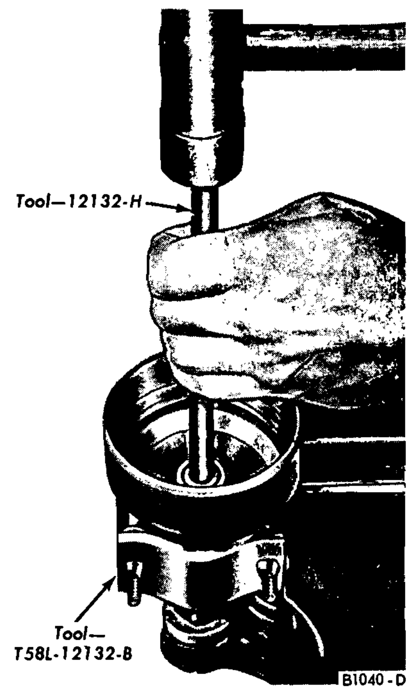


FIG. 10— Lower Bushing Removal

2. Disconnect the distributor-transistor wire from the breaker point assembly.

3. Remove the retaining screws from the breaker point assembly and lift the breaker point assembly out of the distributor.

4. Working from the inside of the distributor, pull distributor-transistor wire through the opening in the distributor.

5. Follow steps 5-15 under Conventional Ignition System Distributor.

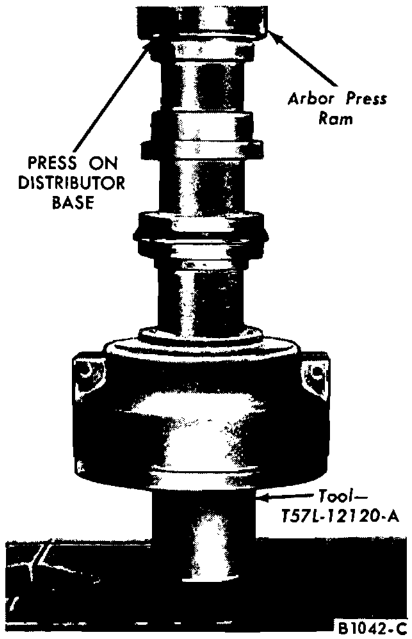


FIG. 11— Upper Bushing Installation

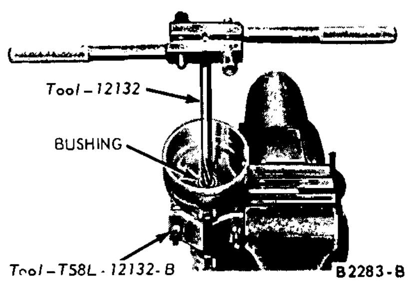


FIG. 12— Burnishing Bushing

BENCH ASSEMBLY

ORIGINAL SHAFT AND GEAR

Conventional Ignition System Distributor

1. Oil the new upper bushing, and install it on the bushing replacer tool. Then install the upper bushing (Fig. 11). When the tool bottoms against the distributor base, the bushing will be installed to the correct depth.

2. Burnish the bushing to the proper size (Fig. 12).

3. Invert the distributor and install the lower bushing in a similar manner.

4. Oil the shaft and slide it into the distributor body.

5. Place the collar in position on the shaft and align the holes in the collar and shaft, then install a new pin (Fig. 6). Install the distributor cap clamps.

6. Check the shaft end play with

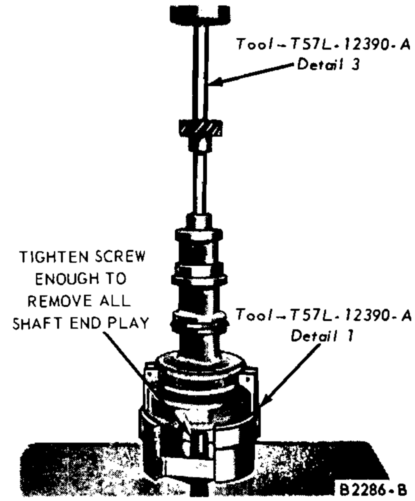


FIG. 13—Original Shaft and Gear Installation

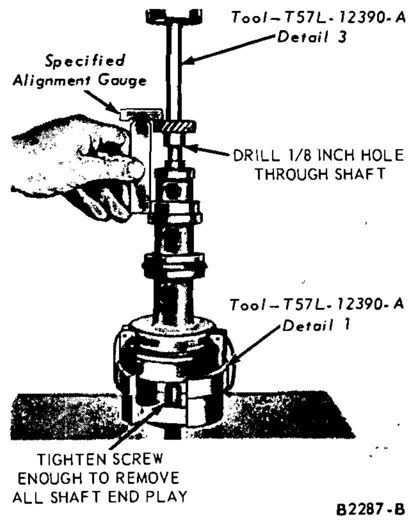


FIG. 14—New Shaft and Gear Installation

a feeler gauge placed between the collar and the base of the distributor. If the end play is not within limits, replace the shaft and gear.

7. Attach the distributor shaft supporting tool to the distributor. Tighten the backing screw in the tool enough to remove all shaft end play.

8. Install the assembly in a press. Press the gear on the shaft (Fig. 13), using the marks made on the gear and shaft as guides to align the pin holes.

9. Remove the distributor from the press. Install the gear retaining pin (Fig. 4).

10. Position the distributor in a vise. Fill the grooves in the weight pivot pins with distributor cam lubricant (C4AZ-19D530-A).

11. Position the weights in the distributor (**the marked weight is placed on the marked pivot pin**) and

install the weight retainers.

12. Place the thrust washer on the shaft.

13. Fill the grooves in the upper portion of the distributor shaft with distributor cam lubricant (C4AZ-19D530-A).

14. Install the cam assembly. **Be sure that the marked spring bracket on the cam assembly is near the marked spring bracket on the stop plate.**

If a new cam assembly is being installed, make sure that the cam is installed with the hypalon covered stop in the correct cam plate control slot. This can be done by measuring the length of the slot used on the old cam and by using the corresponding slot on the new cam. Some of the cams will have the size of the slot in degrees stamped near the slot. **If the wrong slot is used, an incorrect maximum advance will be obtained.**

Place a light film of distributor cam lubricant (C4AZ-19D530-A) on the distributor cam lobes. Install the retainer and the wick. Saturate the wick with SAE 10W engine oil.

15. Install the weight springs. **Be sure that the marked spring is attached to the marked spring brackets.**

16. Place the breaker point and condenser plate in position and install the retaining screws.

17. Working from the inside of the distributor, push the primary wire through the opening in the distributor housing.

18. Place the breaker point assemblies and the condenser in position and install the retaining screws.

19. Align and adjust the breaker point assemblies by following the procedure in Part 9-1.

20. Connect the primary wire, the jumper strap, and the condenser wire to the breaker point assemblies.

21. Install the rotor and the distributor cap.

22. Check and adjust (if necessary) the centrifugal advance mechanism (Refer to Part 9-1).

Transistor Ignition System Distributor

1. Follow steps 1-16 under Original Shaft and Gear—Conventional Ignition System Distributor.

2. Working from the inside of the distributor, push the distributor-transistor wire through the opening in the distributor housing.

3. Place the breaker point assembly in position and install the retaining screws.

4. Align and adjust the breaker point assembly by following the procedure in Part 9-1.

5. Connect the distributor-transistor wire to the breaker point assembly.

6. Check and adjust (if necessary) the centrifugal advance.

7. Install the dust cover and the rotor.

NEW SHAFT AND GEAR

Conventional and Transistor Ignition System Distributor

The shaft and gear are replaced as an assembly. One part should not be replaced without replacing the other.

1. Follow steps 1,2,3 and 4 under "Installing Original Shaft and Gear Conventional Ignition System Distributor."

2. Attach the distributor shaft supporting tool to the distributor and install the assembly in a vise. Insert a 0.024-inch feeler gauge between the backing screw and the shaft. Tighten the backing screw on the tool enough to remove all shaft end play, then remove the feeler gauge and allow the shaft to rest on the backing screw. Slide the collar on the shaft. While holding the collar in place against the distributor base, drill a 1/8-inch hole through the shaft using the hole in the collar as a pilot.

3. Position the gear on the end of the shaft. Install the assembly in a press.

4. With the backing screw on the support tool tightened enough to remove all end play, press the gear on the shaft to the specified distance from the bottom face of the gear to the bottom face of the distributor mounting flange (Fig. 14). Drill a 1/8-inch hole through the shaft using the hole in the gear as a pilot.

5. Remove the distributor from the press and remove the support tool. Install the collar retaining pin (Fig. 6) and the gear retaining pin (Fig. 4).

6. On a conventional ignition system distributor, complete the assembly by following steps 10 thru 22 under "Installing Original Shaft and Gear—Conventional Ignition System Distributor."

On a transistor ignition distributor, complete the assembly by following steps 10-16 under Installing Original Shaft and Gear—Conventional Ignition System Distributor and steps 2-7 under Installing Original Shaft and Gear—Transistor Ignition System Distributor.

PART 9-5— Specifications

INITIAL IGNITION TIMING SPECIFICATIONS

	Engine	Without Exhaust Emission (BTDC) ④		With Exhaust Emission (BTDC) ③ ④	
		Standard Trans.	Automatic Trans.	Standard Trans.	Automatic Trans.
IGNITION TIMING (With vacuum line disconnected)	170	6° ① ②	12° ① ②	5°	5°
	200 All	6° ① ②	12° ① ②	5°	5°
	289 All Except HP	6° ②	6° ②	0°	0°
	390 All Except GT	10° ① ②	10° ① ②	6°	6°
	390 GT	12° ②	12° ②	6°	6°
	427 All	8° ① ②	–	–	–
	289 HP	12°	12° ②	12°	12°

① For altitude operation, and/or to obtain optimum engine performance and fuel economy, it is permissible to advance the initial ignition timing to a maximum of 5° over the "normal" setting. No further improvement in engine performance of fuel economy will be achieved by advancing beyond this point. Advance the timing progressively until engine detonation (spark knock) is evident under actual road test acceleration. Retard the timing until the detonation (spark knock) is eliminated.

② If the individual requirements of the vehicle and/or the use of sub-standard fuels dictate, the initial timing may have to be retarded from the recommended setting to eliminate detonation (spark knock). If retarding is necessary, it should be done progressively and not to exceed 2° BTDC.

③ The ignition timing for Exhaust Emission engines must not be advanced from the recommended setting except for pre-delivery.

④ For pre-delivery, add 2° advance.

SPARK PLUG, COIL AND PRIMARY CIRCUIT RESISTOR SPECIFICATIONS

	Engine	Type	Size	Gap (Inches)	Torque (Ft-Lbs)
Spark Plugs	170	BF-82	18MM	0.032–0.036	15–20
	200	BF-82	18MM	0.032–0.036	15–20
	289 except HP	BF-42	18MM	0.032–0.036	15–20
	390 GT	BF-32	18MM	0.032–0.036	15–20
	390 except GT	BF-42	18MM	0.032–0.036	15–20
	289 HP and 427	BF-32	18MM	0.032–0.036	15–20

	Conventional Ignition System		Transistor Ignition System	
Coil	Primary Resistance (Ohms)	1.40 – 1.54 (75°F)	Primary Resistance (Ohms)	0.226–0.251 (75° F)
	Secondary Resistance (Ohms)	7600–8800 (75°F)	Secondary Resistance (Ohms)	4900–5680 (75°F)
	Amperage Draw (Engine Stopped)	4.5	Amperage Draw (Engine Cranking)	4.0
	Amperage Draw (Engine Idling)	2.5	Amperage Draw (Engine Idling)	5.0
Primary Circuit Resistor	Conventional Ignition System		Transistor Ignition System	
	Resistor (Ohms)	1.30 – 1.40 (75°F)	Emittor (Ohms)	0.31–0.35 (75°F)
			Collector (Ohms)	0.41–0.45 (75°F)
			Base (Ohms)	7.1–7.9 (75° F)

SPECIAL TOOLS

Tool Description	Tool No.	Tool Description	Tool No.
Breaker Point Aligning Tool	KD-111 or TK-419-A	Distributor Testers	RE-236 or RE-1416
Breaker Point Spring Tension Scale	12151	Drive Gear Installing Fixture	T57L-12390-B or T65L-12390-B
Bushing Burnisher	12132	Drive Gear Remover Kit	T52L-12390-D
Bushing Installer	T57L-12120-A or 12132-A	Ignition Oscilloscopes	RE-27-55 or Re-881
Bushing Remover	12132-H	Pin Removing Fixture	T52L-12131-CAD
Distributor Puller	T66L-12132-A	Tach-Dwell Tester	RE-27-44
Distributor Puller Adapter	T66L-12132-B	Timing Light	13-07
Distributor Holding Clamp	T58L-12132-B		

DISTRIBUTOR GENERAL INFORMATION

Engine	Dwell Angle At Idle Speed	Point Gap (Inches)	Breaker Arm Spring Tension (Oz)	Distributor Shaft End Play ①	Gear Location ②	Condenser		
						Capacity (Micro-farads)	Minimum Leakage (Megohms)	Maximum Series Resistance (Ohms)
170/200	37°–42°	0.025	17–21	0.022–0.033	2.510–2.515 ③	0.21–0.25	10	1
289	26°–31°	0.017	17–21	0.024–0.035	4.031–4.038	0.21–0.25	10	1
289 HP	30°–33°	0.020	27–30	0.024–0.035	4.031–4.038	0.21–0.25	10	1
427	22°–24°	0.020	22–24	0.024–0.035	3.071–3.077	–	–	–
Others	26°–31°	0.017	17–21	0.022–0.032	3.071–3.077	0.21–0.25	10	1

① Measured with distributor removed.
② Distance from bottom of mounting flange to bottom of gear.
③ Does not apply to dual advance distributors.

DISTRIBUTOR APPLICATION TABLE

Engine	Vehicle Application	Distributor Number ① And Type			
		Without Exhaust Emission		With Exhaust Emission	
		Standard Trans.	Automatic Trans.	Standard Trans.	Automatic Trans.
170	Falcon	C5DF-C Loadomatic	C5DF-K Loadomatic	C7DF-J Dual Adv.	C7DF-A Dual Adv.
200	All	C5DF-E Loadomatic	C5DF-K Loadomatic	C7DF-C Dual Adv.	C7DF-D Dual Adv.
289 2-V	All	C7OF-A Dual Adv.	C7AF-AE or C7OF-B Dual Adv.	C7OF-D Dual Adv.	C7AF-AH or C7OF-E Dual Adv.
289 4-V	All except HP Mustang	C7ZF-A Dual Adv.	C7ZF-A Dual Adv.	C7ZF-C Dual Adv.	C7ZF-D Dual Adv.
289 4-V	HP Mustang	C5OF-E Centrifugal	C5OF-E Centrifugal	–	–
390 2-V	All	C7AF-AD or C7AF-A Dual Adv.	C7AF-Y, C7AF-AB, or C7AF-B Dual Adv.	C7AF-Z or C7AF-C Dual Adv.	C7AF-AA or C7AF-D Dual Adv.
390 4-V	All except GT and GTA Models	C7AF-E Dual Adv.	C7MF-G or C7SF-A Dual Adv.	C7MF-H or C7SF-B Dual Adv.	C7MF-H or C7SF-B Dual Adv.
390 4-V	All GT and GTA Models	C7AF-U Dual Adv.	C7AF-U Dual Adv.	C7OF-F Dual Adv.	C7OF-F Dual Adv.
427	All	C5AF-F Centrifugal	C5AF-F Centrifugal	–	–

① The basic distributor number (12127) is stamped on the distributor housing. The number used should agree with the above.

LOADOMATIC DISTRIBUTOR ADVANCE CHARACTERISTICS

Distributor Number	Set Test Stand To 0° At 250 Distributor RPM And 0 Inches of Mercury				
	Advance (Crankshaft Degrees) At 2000 Engine RPM	Distributor RPM	Vacuum (Inches Of Mercury)	Advance (Distributor Or Camshaft Degrees)	Maximum Advance (Distributor Degrees)
C5DF-12127-C	26–29	800	0.80	2 1/2–3 1/2	14 1/2
		1200	1.80	6 1/2–7 1/2	
		1800	3.00	8 3/4–10	
		2000	3.90	10 1/4–11 1/2	
C5DF-12127-E	28–31	600	0.44	1–2	15 1/2
		800	0.80	5–6	
		1200	1.90	8 1/4–9 1/4	
		2000	3.80	10 1/4–11 1/2	
C5DF-12127-K	22 1/2–25 1/2	800	0.79	3/4–1 3/4	12 3/4
		1200	1.90	3 3/4–4 3/4	
		1600	3.00	5 3/4–7	
		2000	3.80	7–8 1/4	
C6AF-12127-Y	19 1/2–25 1/2	800	0.90	1–2	12 3/4
		1200	2.10	4 1/2–5 1/2	
		1600	3.60	7–8 1/4	
		2000	4.80	8 3/4–10	

DUAL ADVANCE DISTRIBUTOR ADVANCE CHARACTERISTICS

Distributor Number	Crankshaft Advance At 2000 Engine rpm With Distributor Vacuum Line Connected	Crankshaft Advance At 2000 Engine rpm With Distributor Vacuum Line Disconnected	Vacuum Advance — Set Test Stand to 0° at 1000 Distributor rpm and 0 Inches of Mercury. Vacuum (Inches of Mercury)	Advance (Distributor or Camshaft Degrees)	Max. Adv. (Camshaft Degrees)	Centrifugal Advance — Set Test Stand to 0° at 250 Distributor rpm amd 0 Inches of Mercury. Distributor rpm	Advance (Distributor or Camshaft Degrees)	Max. Adv. (Camshaft Degrees)
			5	0–1		300	0–1/2	
			10	3 1/2–6 3/4		500	1/4–1 1/4	
C7AF-A	25–33	7–9	15	7 1/4–10 1/4	12	1000	3 1/2–4 1/2	14
			20	9–12		1500	5 3/4–7 1/4	
						2000	8 1/4–9 3/4	
			5	0–1		300	0–1/2	
			10	3 1/2–6 1/2		600	1 1/4–2 1/2	
C7AF-B	28–36	10–12	15	7–10	12	1000	5–6	14
			20	9–12		1500	7–8 1/4	
						2000	9–10 1/2	
			5	0–1		300	0–1/2	
			10	3 1/2–6 3/4		500	2–3	
C7AF-C	30–88 1/2	12–14 1/2	15	7 1/4–10 1/4	12	1000	6–7 1/4	16
			20	9–12		1500	8 3/4–10 1/4	
						2000	11 1/2–13	
			5	0–1		300	0–1/2	
			10	3 1/2–6 3/4		500	2–3	
C7AF-D	28 1/2–37	10 1/2–13	15	7–10 1/4	12	1000	5 1/4–6 1/2	16
			20	9–12		1500	8–9 1/2	
						2000	10 3/4–12 1/4	
			5	0–1		300	0–1/2	
			10	3 1/2–6 3/4		600	2 1/4–3 1/4	
C7AF-E	27 1/2–36 1/2	9 1/2–12 1/2	15	7 1/2–10 1/2	12	1000	4 3/4–6 1/4	14
			20	9–12		1500	7–8 1/4	
						2000	8 3/4–10 1/4	
			5	0–1		300	0–1/2	
			10	1–4 3/4		500	3 1/2–4 1/2	
C7AF-U	29–37 1/2	13–15 1/2	15	7–10	11	1000	6 1/2–7 3/4	14
			20	8–11		1500	8 1/4–9 1/2	
						2000	9 3/4–11 1/4	
			5	0–1		500	2–3	
			10	3 1/2–5 1/2		1000	7 1/4–8 1/4	
C7DF-A	22 1/2–30 1/2	14 1/2–16 1/2	15	4–7	7	1300	8 3/4–10	19
			20	4–7		1800	11 1/2–12 3/4	
						2000	12 1/2–14	
			5	0–1 1/2		500	1–2	
			10	7–10		1000	7 1/2–8 1/2	
C7DF-C	34–42	15–17	15	9 1/2–12 1/2	12 1/2	1300	9–10	
			20	9 1/2–12 1/2		1800	10–11 1/2	
						2000	10 1/2–12	
			5	0–1 1/2		700	5–5 3/4	
			10	5 1/2–10		1000	7 3/4–8 3/4	
C7DF-D	34 1/2–42 1/2	15 1/2–17 1/2	15	9 1/2–12 1/2	12 1/2	1200	8 3/4–9 3/4	19
			20	9 1/2–12 1/2		1600	10–11 1/4	
						2000	11 1/2–13	
			5	0–1		400	0–1/2	
			10	3 1/2–6 1/2		800	4 3/4–5 3/4	
C7OF-A	31–39	15–17	15	7 1/4–10 1/4	11	1000	7 1/2–8 1/2	14
			20	8–11		1500	9 3/4–11	
						2000	12–13 3/4	

DUAL ADVANCE DISTRIBUTOR ADVANCE CHARACTERISTICS (Continued)

Distributor Number	Crankshaft Advance At 2000 Engine rpm With Distributor Vacuum Line Connected	Crankshaft Advance At 2000 Engine rpm With Distributor Vacuum Line Disconnected	Vacuum Advance: Set Test Stand to 0° at 1000 Distributor rpm and 0 Inches of Mercury.			Centrifugal Advance: Set Test Stand to 0° at 250 Distributor rpm and 0 Inches of Mercury.		
			Vacuum (Inches of Mercury	Advance (Distributor or Camshaft Degrees)	Max. Adv. (Camshaft Degrees)	Distributor rpm	Advance (Distributor or Camshaft Degrees)	Max. Adv. (Camshaft Degrees)
C7OF-B	34 1/2–42 1/2	15 1/2–17 1/2	5	0–1	12 1/2	300	0–1/2	14
			10	5–8		500	2 3/4–3 3/4	
			15	9 1/4–12 1/4		1000	7 3/4–8 3/4	
			20	9 1/2–12 1/2		1500	9–10 1/2	
						2000	10 1/2–12	
C7OF-D	35–43	16–18	5	0–1	12 1/2	300	0–1/2	16
			10	6–9 1/2		600	3–4	
			15	9 1/2–12 1/2		1000	8–9	
			20	9 1/2–12 1/2		1500	10 1/4–11 1/2	
						2000	12 1/2–14	
C7OF-E	34–42 1/2	17–19 1/2	5	0–1	11 1/2	300	0–1/2	16
			10	5–8 1/4		600	3 1/4–4 1/4	
			15	8 1/2–11 1/2		1000	8 1/2–9 3/4	
			20	8 1/2–11 1/2		1500	10 1/2–11 3/4	
						2000	12 1/4–13 3/4	
C7OF-F	35–43	19–21	5	0–1	11	300	0–1/2	16
			10	1–4 3/4		500	2–3	
			15	7–10		1000	9 1/2–10 1/2	
			20	8–11		1500	11 1/4–12 1/2	
						2000	13–14 1/2	
C7SF-A	29–37 1/2	10–12 1/2	5	0–3/4	12 1/2	300	0–1/2	14
			10	1–4 3/4		500	2 1/4–3 1/4	
			15	7–10		1000	5–6 1/4	
			20	9 1/2–12 1/2		1500	6 3/4–8 1/4	
						2000	8 1/2–10	
C7SF-B	32–40 1/2	13–15 1/2	5	0–3/4	12 1/2	300	0–1/2	16
			10	1–4 3/4		500	2–3	
			15	7–10		1000	6 1/2–7 3/4	
			20	9 1/2–12 1/2		1500	8 3/4–10	
						2000	10 3/4–12 1/4	
C7ZF-A	29–37 1/2	13–15 1/2	5	0–1	11	300	0–1/2	11
			10	3 1/2–6 3/4		600	2 1/2–3 1/2	
			15	7 1/4–10 1/4		1000	6 1/2–7 3/4	
			20	8–11		1500	7 1/2–8 3/4	
						2000	8 1/2–10	
C7ZF-C	33–41 1/2	20–22 1/2	5	0–1	9 1/2	300	0–1/2	14
			10	5–8		500	3 1/4–4 1/4	
			15	6 1/2–9 1/2		1000	10–11 1/4	
			20	6 1/2–9 1/2		1500	10 3/4–12	
						2000	11 1/4–12 3/4	
C7ZF-D	29 1/2–37 1/2	20 1/2–22 1/2	5	0–1	7 1/2	300	0–1/2	14
			10	3–6		600	1 3/4–2 3/4	
			15	4 1/2–7 1/2		1000	10 1/4–11 1/4	
			20	4 1/2–7 1/2		1500	11–12 1/4	
						2000	11 1/2–13	
C7MF-G	36–45	17–20	5	0–1	12 1/2	300	0–1/2	14
			10	3 1/2–6 1/2		500	2 1/4–3 1/4	
			15	8–11		1000	5–6 1/4	
			20	9 1/2–12 1/2		1500	6 3/4–8 1/4	
						2000	8 1/2–10	

DUAL ADVANCE DISTRIBUTOR ADVANCE CHARACTERISTICS (Continued)

Distributor Number	Crankshaft Advance At 2000 Engine rpm With Distributor Vacuum Line Connected	Crankshaft Advance At 2000 Engine rpm With Distributor Vacuum Line Disconnected	Vacuum Advance — Set Test Stand to 0° at 1000 Distributor RPM and 0 Inches of Mercury.			Centrifugal Advance — Set Test Stand to 0° at 250 Distributor rpm and 0 Inches of Mercury.		
			Vacuum (Inches of Mercury)	Advance (Distributor or Camshaft Degrees)	Max. Adv. (Camshaft Degrees)	Distributor rpm	Advance (Distributor or Camshaft Degrees)	Max. Adv. (Camshaft Degrees)
C7MF-H	40–48	21 1/2–24 1/2	5	0–1	12 1/2	300	0–1/2	14
			10	3 1/2–6 1/2		500	2–3	
			15	8–11		1000	6 3/4–7 3/4	
			20	9 1/2–12 1/2		1500	8 3/4–10	
						2000	10 3/4–12 1/4	
C7AF-AA	29 1/2–38	12 1/2–15	5	0–1	11 1/2	300	0–1/2	14
			10	4 1/4–7		600	2 1/4–3 1/4	
			15	8 1/2–11 1/2		1000	6 1/4–7 1/2	
			20	8 1/2–11 1/2		1500	8 1/2–9 3/4	
						2000	10 1/2–12	
C7AF-AB	26–34	9–11	5	0–1	11 1/2	300	0–1/2	14
			10	4–7		600	3/4–1 3/4	
			15	8 1/2–11 1/2		1000	4 1/2–5 1/2	
			20	8 1/2–11 1/2		1500	6 1/2–7 1/2	
						2000	8 1/4–9 3/4	
C7AF-AC	32 1/2–40 1/2	13 1/2–15 1/2	5	0–1	12 1/2	300	0–1/2	14
			10	1–5		500	1–2	
			15	7–10		1000	6 3/4–7 3/4	
			20	9 1/2–12 1/2		1500	8 3/4–10	
						2000	10 3/4–12 1/4	
C7AF-AD	26–34	7–9	5	0–1	12 1/2	300	0–1/2	14
			10	5–8		500	1/4–1 1/4	
			15	9 1/2–12 1/2		1000	3 1/2–4 1/2	
			20	9 1/2–12 1/2		1500	5 3/4–7 1/4	
						2000	8 1/4–9 3/4	
C7AF-AE	36 1/2–44 1/2	17 1/2–19 1/2	5	0–1	12 1/2	300	0–1/2	14
			10	6–9 1/2		500	3 1/4–4 1/2	
			15	9 1/2–12 1/2		1000	8 3/4–9 3/4	
			20	9 1/2–12 1/2		1500	9 1/2–11	
						2000	10 1/2–12	
C7AF-AH	28 1/2–36 1/2	14 1/2–16 1/2	5	0–1	10	300	0–1/2	14
			10	1 1/2–4 1/2		600	3/4–1 3/4	
			15	6–9 1/4		1000	7 1/4–8 1/4	
			20	7–10		1500	9 1/2–10 3/4	
						2000	10 3/4–12 1/4	

CENTRIFUGAL DISTRIBUTOR ADVANCE CHARACTERISTICS

Distributor	Crankshaft Advance At 2000 Engine rpm	Set Test Stand To 0° At 250 Distributor rpm And 0 Inches Mercury		
		Distributor rpm	Advance (Camshaft Or Distributor Degrees)	Max. Adv. (Camshaft Degrees)
C5AF-F	14 1/2–17	650	2 1/4–4	16
		750	4–5 1/2	
		1000	7 1/4–8 1/2	
		1600	9 3/4–11	
		2000	11 1/2–13	
C5OF-E	13–15	650	2 1/4–3 3/4	14
		750	4–5 1/2	
		1000	6 1/2–7 1/2	
		1600	7 1/2–8 3/4	
		2000	8 1/4–9 3/4	

Fuel System

GROUP 10

PART 10-1—*General Fuel System Service*

This part covers general fuel system diagnosis, tests, adjustment and repair procedures. In addition, the cleaning and inspection procedures are covered.

For fuel system component removal, disassembly, assembly, installation, major repair procedures and specifications, refer to the pertinent part of this group.

The carburetor identification tag is attached to the carburetor. The basic part number for all carburetors is 9510. To procure replacement parts, it is necessary to know the part number prefix and suffix and, in some instances, the design change code (Fig. 1).

Always refer to the Master Parts Catalog for parts usage and interchangeability before replacing a carburetor or a component part for a carburetor.

1 DIAGNOSIS AND TESTING

DIAGNOSIS

FUEL TANK, LINES AND FILTER

Water and dirt that accumulate in the fuel tank can cause a restricted fuel line or filter and malfunction of the fuel pump or carburetor. Condensation, which is the greatest source of water in the fuel tank, is formed by moisture in the air when it strikes the cold interior walls of the fuel tank.

If the accumulation of sediment in the filter is excessive, the fuel tank should be removed and flushed, and the line from the fuel pump to the tank should be blown out with compressed air.

Leakage in the fuel inlet line can cause low suction and capacity conditions, in addition to the loss of fuel.

A restricted fuel tank vent can cause low fuel pump pressure and volume may, in some instances, result in collapsed inlet line hoses or a collapsed fuel tank.

Refer to Fuel Pump, Tank and Lines Diagnosis Guide (Fig. 40) for fuel system complaints and causes.

FUEL PUMP

Incorrect fuel pump pressure and low volume (capacity or flow rate) are the two most likely fuel pump troubles that will affect engine performance. Low pressure will cause a lean mixture and fuel starvation at high speeds and excessive pressure will cause high fuel consumption and carburetor flooding. Low volume will cause fuel starvation at high speeds.

Refer to Fuel Pump, Tank and Lines Diagnosis Guide (Fig. 40) for the causes of fuel pump performance complaints.

CARBURETORS

Prior to performing an extensive diagnosis of carburetor malfunction on a Thermactor exhaust emission control equipped vehicle, disconnect the backfire suppressor valve vacuum sensing and air supply lines at the intake manifold. Plug the manifold connections to prevent leakage. Normal fuel system diagnosis procedures can then be performed.

Dirt in the fuel and air passages, improper idle adjustments, and improper fuel level are the major sources of carburetor troubles.

Refer to Carburetor Diagnosis Guide (Fig. 40) for the causes of carburetor complaints.

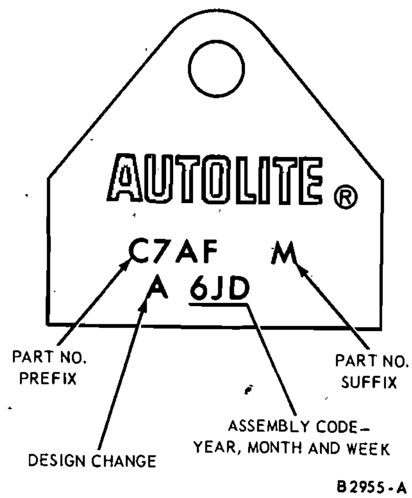


FIG. 1—Typical Carburetor Identification Tag

TESTS

FUEL PUMP TESTS

To determine that the fuel pump is in satisfactory operating condition, tests for both fuel pump pressure and fuel pump capacity (volume) should be performed.

The tests are performed with the fuel pump installed on the engine and the engine at normal operating temperature and at idle speed.

Before the tests, make sure the replaceable fuel filter has been changed with the recommended maintenance mileage interval. When in doubt, install a new filter.

Pressure Tests

Refer to Fuel System Specifications, Part 10-11, and note the fuel pump pressure and capacity (volume) design tolerances.

1. Remove the air cleaner assembly. Disconnect the fuel inlet line or the fuel filter at the carburetor. **Use care to prevent combustion due to fuel spillage.**
2. Connect a pressure gauge, a restrictor and a flexible hose (Fig. 2) between the fuel filter and the carburetor.
3. Position the flexible hose and the restrictor so the fuel can be discharged into a suitable, graduated container (Fig. 2).
4. Before taking a pressure reading operate the engine at the specified idle rpm (Part 10-11) and vent the system into the container by opening the hose restrictor momentarily.
5. Close the hose restrictor, allow the pressure to stabilize, and note the reading. Refer to Specifications, Part 10-11.

If the pump pressure is within specifications, perform the test for fuel capacity (volume).

Capacity (Volume) Test

With the fuel pump pressure within specifications, test the capacity (volume) as follows:

1. Operate the engine at the specified idle rpm.

2. Open the hose restrictor and expel the fuel into the container (Fig. 2), while observing the time required to expel one pint; then close the restrictor. One pint of fuel should be expelled within the specified time limit (Part 10-11).

If the pump volume is below specifications, repeat the test using an auxiliary fuel supply. If the pump volume meets specifications while using the auxiliary fuel supply, check for a restriction in the fuel supply from the tank and for the tank not venting properly.

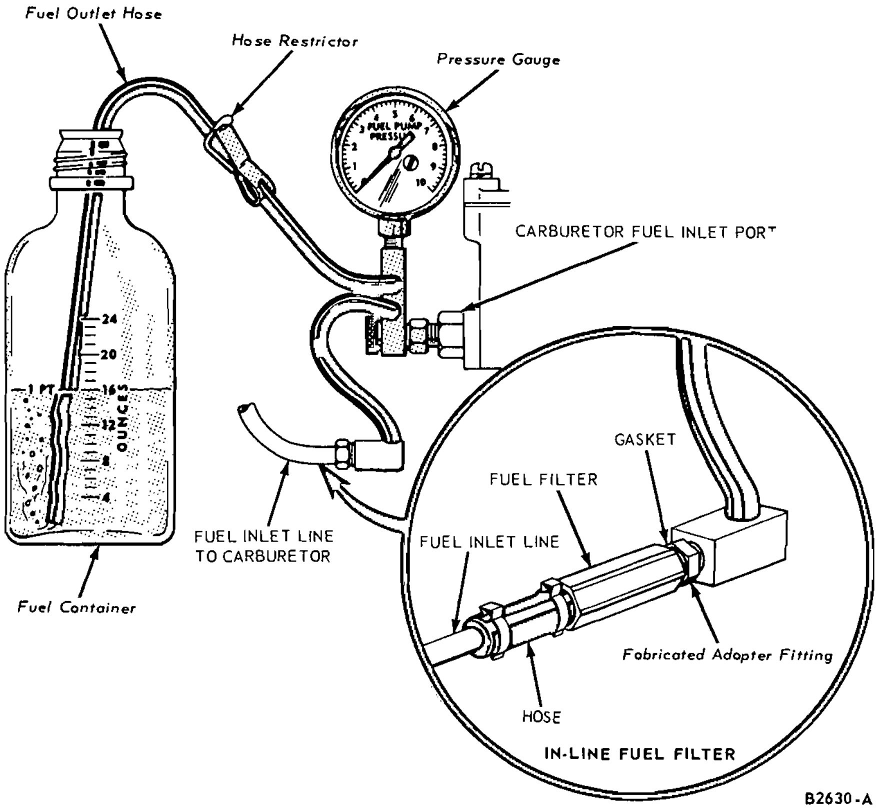


FIG. 2—Typical Fuel Pump Pressure and Capacity Test Equipment

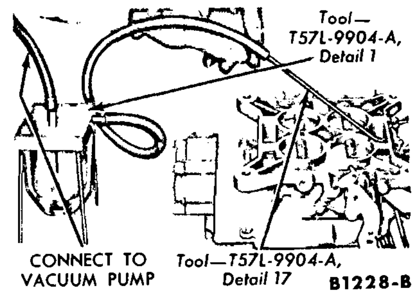


FIG. 3—Typical Autolite Carburetor Power Valve Test for Models 2100 and 4100

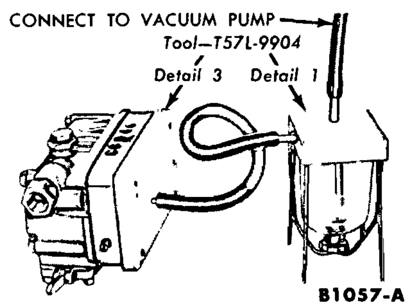


FIG. 4—Typical Holley Carburetor Power Valve Test

AIR INTAKE DUCT VALVE TEST—289 V-8

Proper operation of the air intake duct thermostatic valve can be determined by the following test:

1. Remove the air duct (Part 10-8). Place the air duct assembly in a container of cool water (below 75° F). Be sure that the thermostat is covered by the water.

2. Place a thermometer in the water and observe the temperature.

3. With water temperature at 75° F. or below, the valve should be in the heat-on position.

4. Using a hot plate or other suitable device, heat the water slowly.

5. When the water temperature reaches 85° F., the valve should start to open. **If the valve does not start to open at this time, stabilize the water temperature at 85° F. for eight minutes before condemning the unit.**

6. When the water temperature reaches 100° F. or higher, the valve should be in the full heat-off position.

7. If the operation of the valve is unsatisfactory, remove the thermostat and spring assembly and check the valve plate shaft for binding.

8. If the valve plate moves freely, replace the thermostat and spring assembly. Retest the heat-on and the heat-off temperatures.

9. If the valve does not operate correctly, adjust the thermostat rod. By increasing the rod length, the valve plate will be moved toward the heat-off position. By decreasing the rod length the valve plate will be moved toward the heat-on position.

CARBURETOR TESTS

Accelerating Pump Discharge Test

1. Remove the air cleaner (Part 10-8).

2. Open the primary throttle plates and observe the fuel flow from the accelerating pump discharge nozzles. If the system is operating correctly, a quick steady stream of fuel will flow from the discharge nozzles.

Power Valve Tests

A power valve test can be performed only on the Autolite Models 2100 2-V and 4100 4-V and Holley 4-V carburetors.

A power valve must not be replaced unless it is leaking sufficiently to cause an unadjustable rough engine idle condition. Fuel accumulation in the power valve cover does not necessarily indicate a defective power valve. Fuel vapors will be drawn into the vacuum side of the power valve and condense during periods of deceleration. Leakage in the power valve area can be caused by an improperly tightened cover or defective gaskets. Any defect in the gasket sealing qualities must be corrected before the power valve is replaced.

Power valve leakage that causes an unadjustable rough engine idle condition can be diagnosed, in most instances, by the fact that the idle mixture needle(s) must be nearly, or completely seated in order to obtain a relatively smooth engine idle condition. If power valve leakage is suspected, the following test procedure must be performed.

Autolite Model 2100 2-V and Model 4100 4-V Carburetors

1. Remove the carburetor from the intake manifold. Invert the carburetor.

2. Remove the glass bowl from the fixture (Fig. 3). Fill the bowl half-full of water. Install the bowl on the fixture.

3. Connect a line from the vacuum pump to the fitting on top of

the fixture. Insert the large OD end of the wand into the tube and attach the other end of the tube to the fitting on the side of the fixture. Slip the rubber gasket (furnished with the tool) over the small OD end of the wand. Hold this end against the power valve vacuum pick-up port (Fig. 3).

4. Look for bubble formations in the water in the bowl. A continuous stream of bubbles indicates leakage through the power valve diaphragm or gasket, or the cover or gasket.

If leakage is encountered, the power valve, power valve gasket, cover, and cover gasket should be replaced one at a time with a new part and the test repeated until the source of leakage has been found. If the source of leakage can not be found, the gasket seats are damaged and the defective parts should be replaced.

A few bubbles may be noticed immediately upon attaching the vacuum line. The bubbling should stop within approximately 15 seconds or after the air has been removed from the system. If no bubbles are seen, the power valve, gaskets and cover are sealing properly.

Holley 4-V Carburetor

1. Remove the secondary fuel bowl(s) and secondary metering block(s) from the carburetor.

2. Install the fuel bowl, metering block, and gaskets on the adapter plate (Fig. 4). **Be sure the fuel bowl screws are properly tightened.**

3. Remove the glass bowl from the fixture and fill it half-full of water.

4. Install a bowl on the fixture.

5. Connect a line from a vacuum pump to the fitting on top of the fixture.

6. Connect a line from the adapter plate to the fitting on the side of the fixture.

7. Follow step 4 under Power Valve Tests for the Autolite Model 2100 2-V and Model 4100 4-V Carburetor.

2 COMMON ADJUSTMENTS AND REPAIRS

CARBURETOR ADJUSTMENTS

FLOAT ADJUSTMENT — DRY

Autolite Model 1100 1-V

The dry float fuel level adjustment for the Autolite Model 1100 1-V carburetor is a final float or fuel level adjustment.

1. Remove the carburetor air horn and gasket from the carburetor. Refer to Air Horn to Main Body Gasket Replacement in this section for the proper procedure.

2. Measure the distance from the gasket surface of the upper body (air horn) to the top of the float (Fig. 5). If the float adjustment is not within the specified dimension, bend the float arm tab, as necessary, to obtain the specified dimension. **Do not apply pressure on the fuel inlet needle. The viton tip of the fuel inlet needle may be damaged through undue pressure exerted on it and cause an improper fuel level within the bowl.**

3. Install the carburetor air horn and a new gasket on the carburetor. Refer to Carburetor Air Horn to Main Body Gasket Replacement (in this section) for the proper procedure.

Carter YF Type 1-V

The dry float fuel level adjustment for the Carter YF Type 1-V carburetor is a final float or fuel level adjustment.

1. Remove the carburetor air horn and gasket from the carburetor. Refer to Air Horn to Main Body Gasket Replacement in this section for the proper procedure.

2. Fabricate a float level gauge (Fig. 6) to the specified float level dimension.

3. Invert the air horn assembly, and check the clearance from the top of the float to the bottom of the air horn with the float level gauge (Fig. 6). Hold the air horn at eye level when gauging the float level. The float arm (lever) should be resting on the needle pin. Bend the float arm as necessary to adjust the float level (clearance). **Do not bend the tab at the end of the float arm,** it prevents the float from striking the bottom of the fuel bowl when empty.

4. Install the carburetor air horn and a new gasket on the carburetor. Refer to Carburetor Air Horn to Main Body Gasket Replacement (in this section) for the proper procedure.

Autolite Models 2100 2-V and 4100 4-V

The dry float adjustment is a preliminary fuel level adjustment only. The final adjustment (Fuel Level Float Adjustment — Wet) must be made after the carburetor is mounted on the engine.

With the air horn removed, the float raised and the fuel inlet needle seated, check the distance between the top surface of the main body and the top surface of the float for conformance to specifications (Part 10-11). Take the measurement near the center of the float at a point 1/8 inch from the free end of the float.

If the cardboard float gauge is used, place the gauge in the corner of the enlarged end section of the fuel bowl (Fig. 7). The gauge should

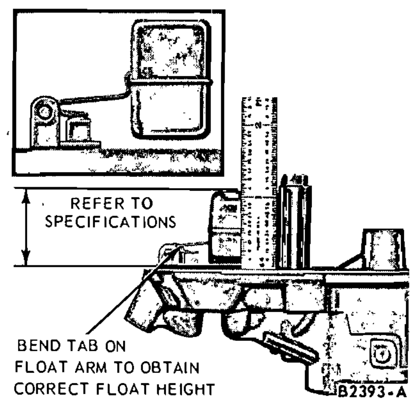


FIG. 5—Fuel Level Float Adjustment —Autolite Model 1100 1-V

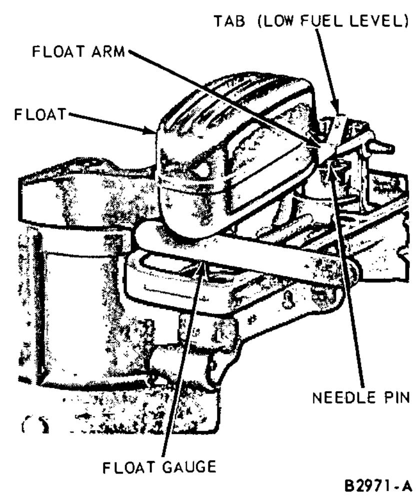


FIG. 6—Fuel Level Float Adjustment —Carter YF Type 1-V

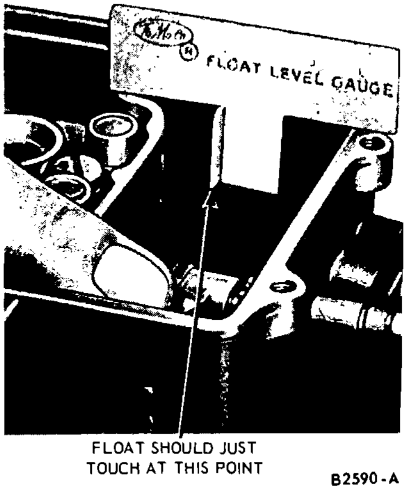


FIG. 7—**Fuel Level Float Adjustment (Dry) Autolite Models 2100 2-V and 4100 4-V**

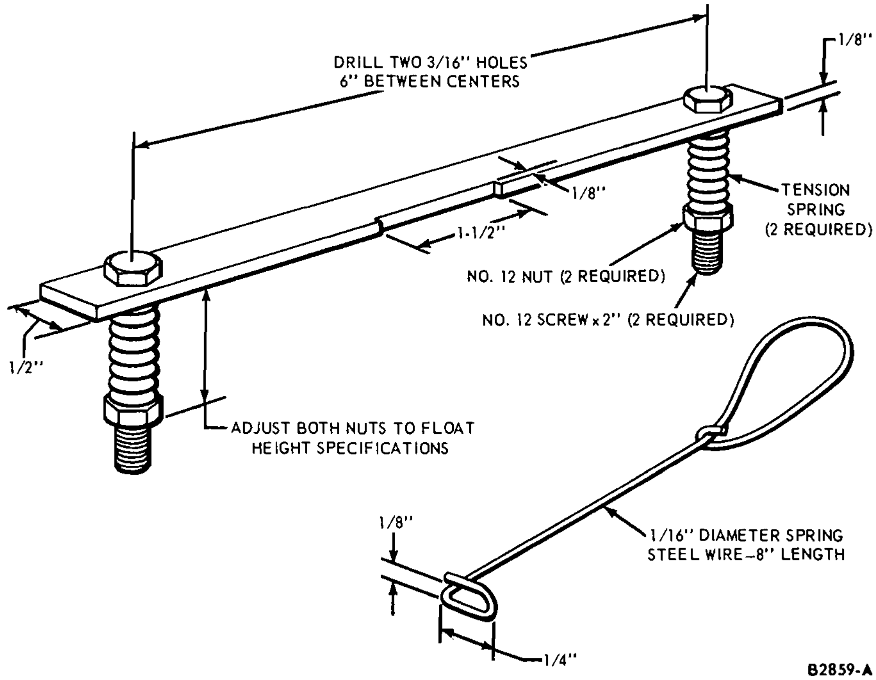


FIG. 8—**Float Gauge and Bending Tool Details — Autolite Model 4300 4-V**

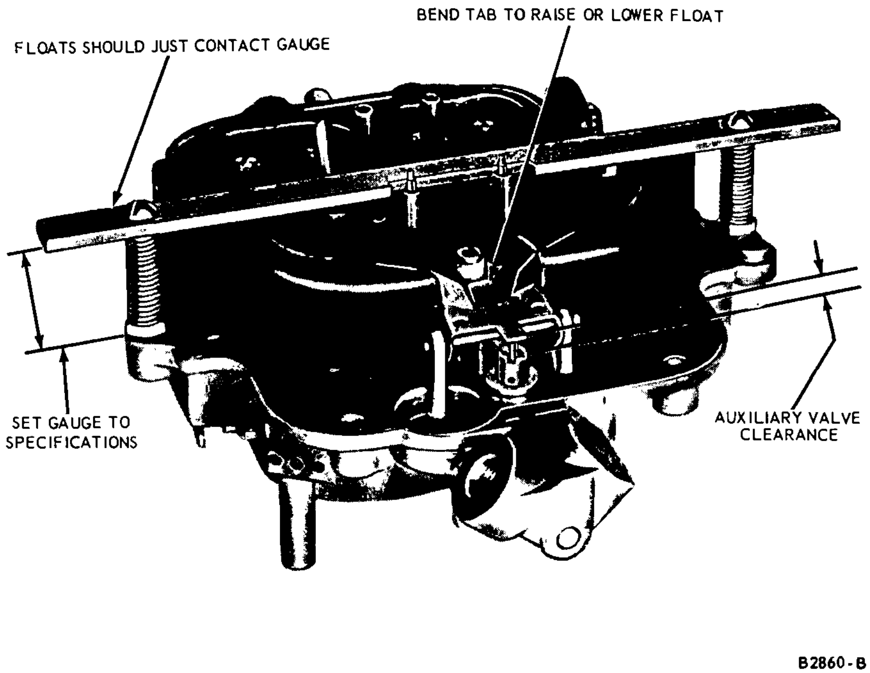


FIG. 9—**Float and Auxiliary Fuel Valve Setting — Autolite Model 4300 4-V**

touch the float near the end, but not on the end radius.

Depress the float tab to seat the fuel inlet needle. **The float height is measured from the gasket surface of the main body with the gasket removed.** If necessary, bend the tab on the float to bring the setting within the specified limits. This should provide the proper preliminary fuel level setting.

Autolite Model 4300 4-V — Float and Auxiliary Valve

To simplify parallel setting of the dual pontoons, refer to Fig. 8 for the construction of an adjustable float gauge and a float tab bending tool.

1. Adjust gauge to the specified height.

2. Insert gauge into the air horn outboard holes (Fig. 9).

3. Check the clearance and alignment of the pontoons to the guage. Both pontoons should just touch the gauge for the proper setting. Align the pontoons if necessary by slightly twisting the pontoons.

If it is necessary to adjust the float clearance, bend the primary needle tab downward to raise the float and upward to lower the float.

To bend the tabs with the float bending tool, the procedure is as follows:

To Raise the Float. Insert the open end of the bending tool to the RIGHT side of the float lever tab and between the needle and float hinge. Raise the float lever off the needle and bend the tab downward.

To Lower The Float. Insert the open end of the bending tool to the LEFT side of the float lever tab, between the needle and float hinge. Support the float lever and bend the tab upward.

Auxiliary Valve Setting. Check the auxiliary valve clearance (Fig. 9). If it is necessary to adjust the auxiliary valve and float tab to the specified clearance, use the bending tool shown in Fig. 8.

Holley 4-V

The dry float adjustment is a preliminary fuel level adjustment only. The final adjustment (Fuel Level Float Adjustment—Wet) must be performed after the carburetor is installed on the engine.

As a preliminary adjustment, adjust the float so that the center of the float is an equal distance from the

top and bottom of the fuel bowl with the fuel bowl inverted (Fig. 10).

SECONDARY THROTTLE PLATE ADJUSTMENT— AUTOLITE MODEL 4100 4-V AND HOLLEY 4-V

1. Hold the secondary throttle plates closed.
2. Turn the secondary throttle shaft lever adjusting screw (stop screw) out (counterclockwise) until the secondary throttle plates stick in the throttle bores (Figs. 11 and 12).
3. Turn the screw in (clockwise) until the screw JUST contacts the secondary lever.
4. Turn the screw (clockwise) the specified distance (Part 10-11).

SECONDARY THROTTLE AIR VALVE ADJUSTMENT— AUTOLITE MODEL 4300 4-V

The secondary throttle air valve spring and housing are adjusted to apply a predetermined load on the secondary air valve shaft.

If the spring housing (Fig. 13) has been moved or maladjusted, adjust the spring tension as follows:

1. Loosen the air valve spring housing screw and let the housing rotate to the no-load position.
2. With the air valve plates in the closed position, scribe an index mark on the air horn casting and the spring housing.
3. Rotate the spring housing counterclockwise the specified number of notches past the index mark on the housing (Part 10-11). Then position the spring retainer and tighten the retainer screw.

AUTOMATIC CHOKE PLATE CLEARANCE (PULLDOWN) AND FAST IDLE CAM LINKAGE ADJUSTMENT

Autolite Model 1100 1-V

The automatic choke fast idle cam linkage must be properly adjusted before performing the choke plate clearance (pull-down) adjustment, because the position of the pull-down rod is one of the determining factors affecting the throttle-to-choke opening relationship.

1. Insert a gauge pin or drill of the specified clearance (Part 10-11) thickness between the throttle plate and the side of the throttle bore. Hold the throttle plate against the gauge pin or drill (Fig. 14). Close the choke plate and turn the fast idle screw inward until it just contacts the fast idle cam.
2. Place a drill or gauge of the same thickness as the specified clearance (Part 10-11) between the choke plate and the upper body wall (Fig. 14). Close the choke plate on the drill or gauge and hold it securely.
3. Close the throttle until the fast idle screw touches the fast idle cam. Adjust the plastic nut to just contact the swivel on the choke lever assembly.

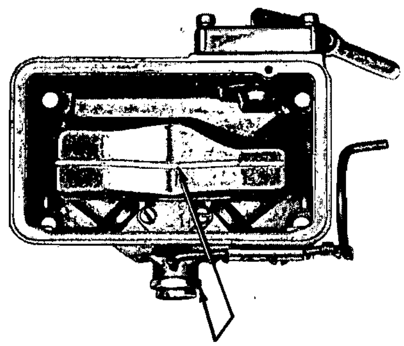


FIG. 10—Float Adjustment (Dry) Holley 4-V

FIG. 11—Secondary Throttle Plate Adjustment—Autolite Model 4100 4-V

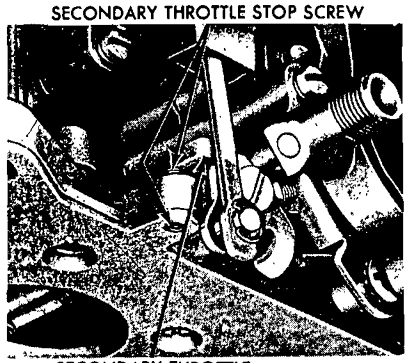


FIG. 12—Secondary Throttle Plate Adjustment — Holley 4-V

Carter Model YF 1-V

1. Remove the air cleaner (Part 10-8), then remove the choke thermostatic spring housing from the carburetor. To remove the thermostatic spring housing with the carburetor installed on the engine, refer to Thermostatic Spring Housing and Gasket Replacement in this Section.
3. Hold the throttle plate fully open and close the choke plate as far as possible without forcing it. Use a drill of the proper diameter to check the clearance between the choke plate and air horn (Fig. 15).
4. If the clearance is not within specification, adjust by bending the arm on the choke trip lever. Bending the arm downward will increase the clearance, and bending it upward will decrease the clearance. Always recheck the clearance after making any adjustment.
5. Install the baffle plate, gasket and thermostatic coil housing. Be sure the thermostatic spring engages the tang on the choke lever and shaft assembly.
6. Set the thermostatic choke housing to the specified index mark (Part 10-11) and tighten the retaining screws.
7. If the choke plate clearance and fast idle cam linkage adjustment was performed with the carburetor on the engine, adjust the engine idle speed and fuel mixture. Adjust the anti-stall dashpot (if so equipped).

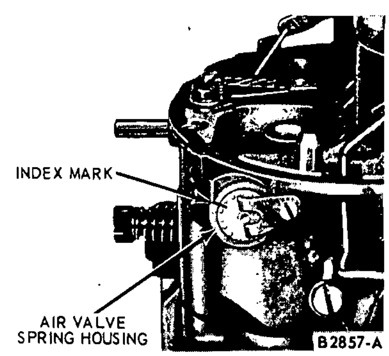


FIG. 13—Secondary Throttle Air Valve Spring Adjustment — Autolite Model 4300 4-V

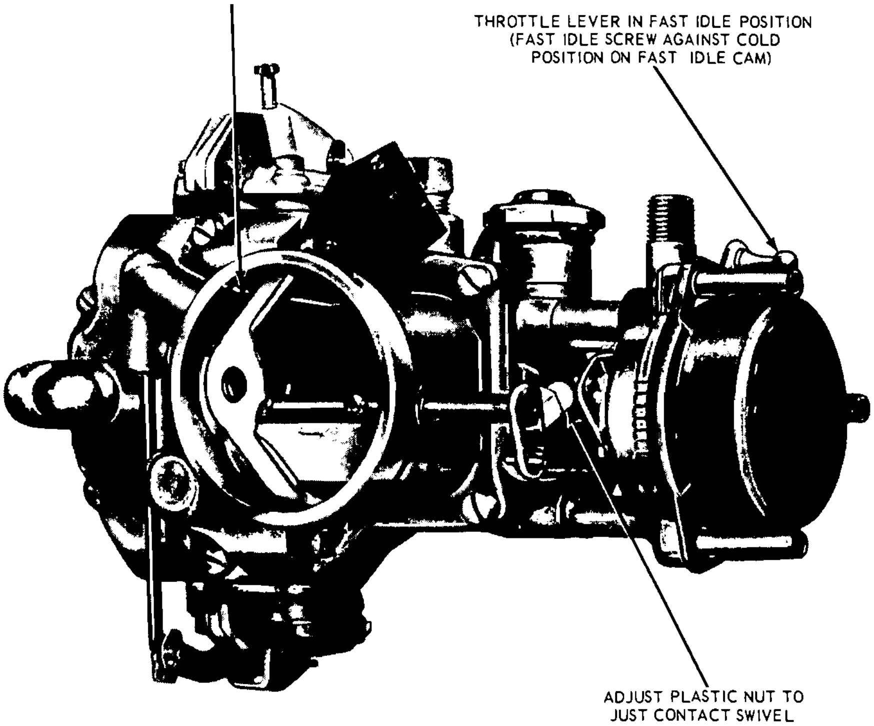


FIG. 14—Choke Plate Clearance (Pull-Down) Adjustment—Autolite Model 1100 1-V

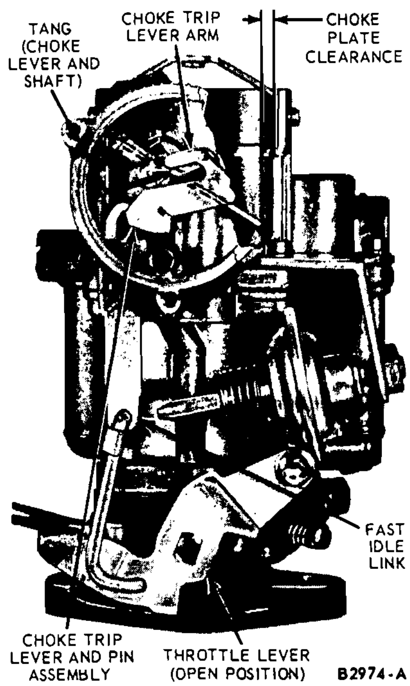


FIG. 15—Choke Plate Clearance (Pull-Down) Adjustment—Carter Model YF 1-V

Autolite 2-V and 4-V Carburetors

1. Remove the air cleaner (Part 10-8), then remove the choke thermostatic spring housing from the carburetor. To remove the thermostatic spring housing with the carburetor installed on the engine, refer to Thermostatic Spring Housing and Gasket Replacement in this section.
2. Bend a wire gauge of the specified diameter (Part 10-11) at a 90° angle approximately 1/8-inch from one end.
3. Block the throttle about half-open so the fast idle cam does not contact the fast idle adjustment screw, then insert the bent end of the wire gauge between the lower edge of the piston slot and the upper edge of the right hand slot in the choke housing (Figs. 13, 14 and 15).
4. Pull the choke piston lever counterclockwise until the gauge is snug in the piston slot. Hold the wire gauge in place by exerting light pressure on the choke piston lever. Check the choke plate clearance (pull-down) between the front of the plate and the wall of the air horn. Adjust the choke plate to the specified clearance (Part 10-11).

Set the fast idle cam clearance. Refer to Fast (cold engine) Idle Speed in this section.

On the **Autolite Models 2100 (2-V) and 4100 (4-V)** carburetors, turn the choke plate clevis adjusting nut as required to obtain the specified choke plate clearance (Part 10-11).

On the **Autolite Model 43 (4-V)** carburetor, adjust the choke plate clearance to specifications (Part 10-11) by bending the adjusting arm on the choke shaft lever. Bend the lever **downward to increase** or **upward to decrease** the clearance.

5. Install the gasket and thermostatic spring housing on the choke housing. Install the spring housing retainer and screws.
6. Rotate the spring housing counterclockwise (rich direction) to align the center index mark on the choke housing with the index mark on the spring housing. Rotate the spring housing an additional 90 degrees counterclockwise (Figs. 16 and 17) and tighten the retaining screws.
7. On the **Autolite Models 2100 2-V and 4100 4-V** carburetors, check the clearance between the front of the choke plate and the air horn wall. Turn the fast idle cam lever adjusting screw (Fig. 19) **inward to increase** the clearance and **outward to decrease** the clearance. Make sure the fast idle screw stays at the index mark on the fast idle cam during the adjustment.

On the **Autolite Model 4300 4-V** carburetor, position the fast idle speed adjusting screw end on the kickdown step of the fast idle cam. Check the clearance between the front of the choke plate and the air horn wall. Turn the fast idle adjusting screw **inward to increase** the clearance or **outward to decrease** the clearance. Make sure the fast idle speed adjusting screw stays at the kickdown step of the fast idle cam during the adjustment.

8. Set the thermostatic choke housing to the specified index mark (Part 10-11) and tighten the retaining screws.
9. If the choke plate clearance and fast idle cam linkage adjustment was performed with the carburetor on the engine, adjust the engine idle speed and fuel mixture. Adjust the anti-stall dashpot (if so equipped).

DECHOKE CLEARANCE—AUTOLITE MODEL 4300 4-V

1. Open the throttle plate to the wide-open-throttle position and hold.
2. Rotate the choke plate towards the closed position until the pawl on the fast idle speed lever contacts the fast idle cam (Fig. 20).

3. Check the clearance between the upper edge of the choke plate and the air horn wall.

4. Adjust the clearance to specifications by bending the pawl on the fast idle speed lever forward to increase or backward to decrease the clearance.

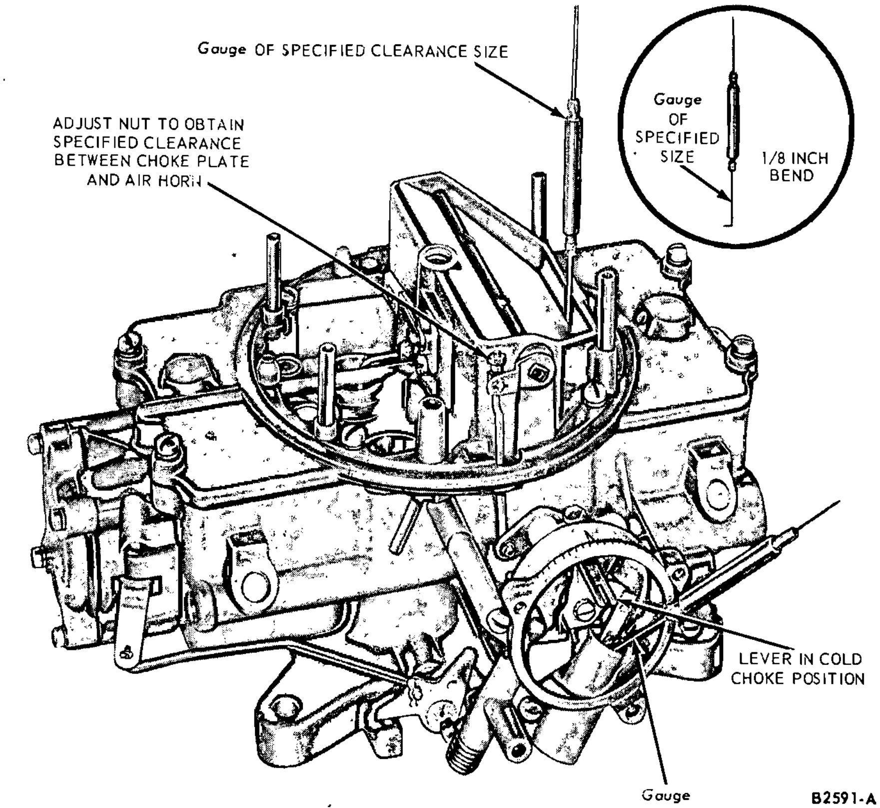


FIG. 16—Choke Plate Clearance (Pull-Down) Adjustment (Typical)—Autolite Models 2100 2-V and 4100 4-V

AUTOMATIC CHOKE THERMOSTATIC SPRING HOUSING ADJUSTMENT

The automatic choke has an adjustment to control its reaction to engine temperature. By loosening the clamp screws that retain the thermostatic spring housing to the choke housing, the spring housing can be turned to alter the adjustment. Turning the housing in a counterclockwise direction will require a higher thermostatic spring temperature (cold weather operation) to fully open the choke plate. Turning the spring housing in the opposite direction (clockwise) will cause the choke plate to be fully open at a lower thermostatic spring temperature (hot weather operation). This is the lean direction, as indicated by the arrow on the choke thermostatic spring housing. Refer to the specifications (Part 10-11) for the proper setting for normal ambient temperatures.

1. Remove the air cleaner assembly (Part 10-8), heater hose and mounting bracket (if so equipped) from the carburetor, if they have not been previously removed.

On the Autolite Model 4300 4-V carburetor, loosen the choke heat tube nut. **The molded-in fitting on the thermostatic choke cover must be held with a wrench while the heat tube nut is turned.**

2. Loosen the thermostatic spring housing clamp retaining screws. Set the spring housing to the specified (Part 10-11) index mark (Fig. 21) and tighten the clamp retaining screws.

On the Autolite Model 4300 4-V carburetor, also tighten the choke heat tube nut while holding the fitting on the choke cover with a wrench.

3. If other carburetor adjustments are not required, install the heater hose and mounting bracket (if so equipped) and the air cleaner assembly (Part 10-8, Section 2) on the carburetor.

FUEL LEVEL FLOAT ADJUSTMENT — WET

Autolite Models 1100 1-V and 4300 4-V and Carter YF Type 1-V

The design of these carburetors

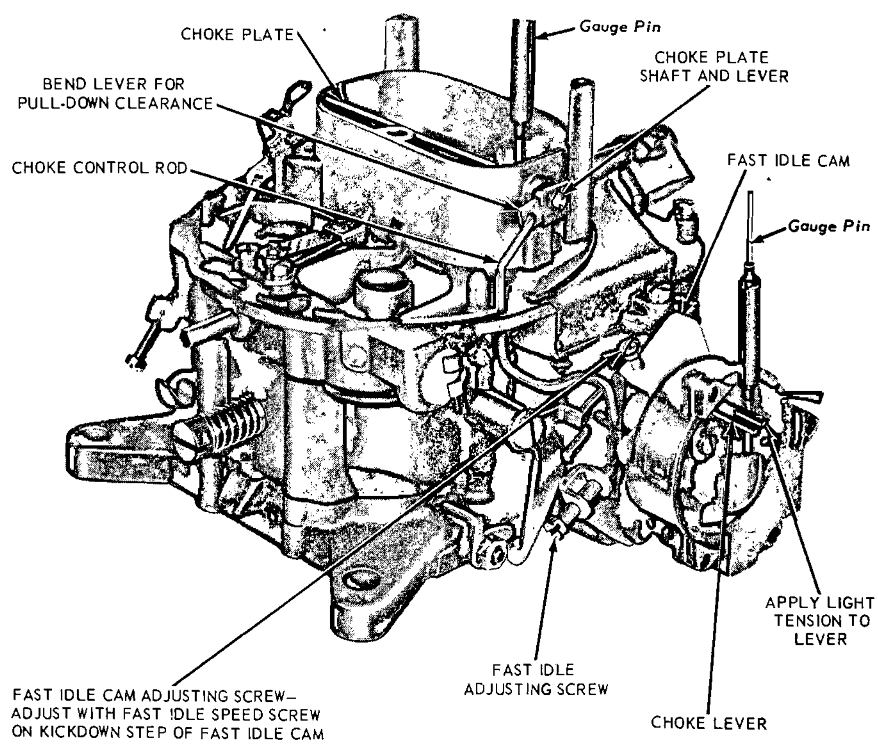


FIG. 17—Choke Plate Pull-Down and Fast Idle Cam Adjustment— Autolite Model 4300 4-V

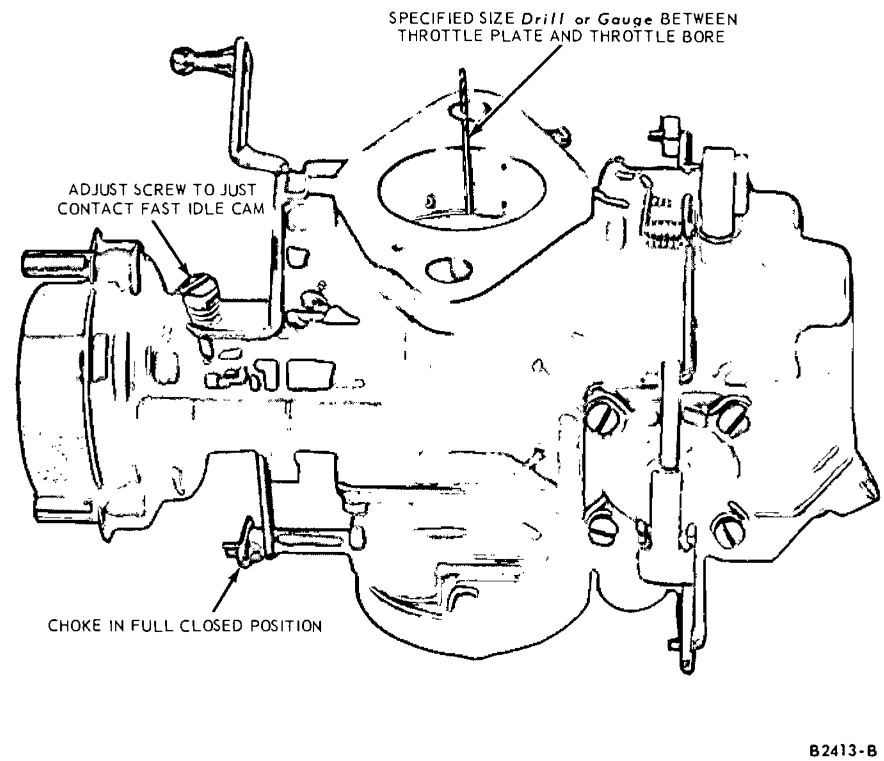


FIG. 18—Fast Idle Cam Linkage Adjustment— Autolite Model 1100 1-V

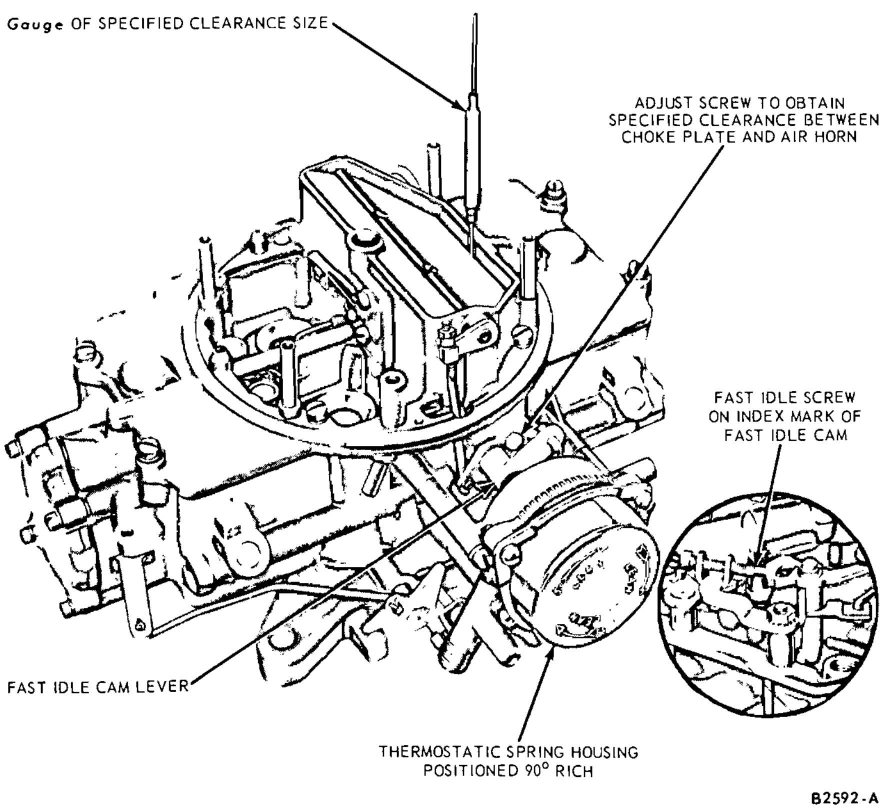


FIG. 19—Fast Idle Cam Linkage Adjustment (Typical)—Autolite Model 2100 2-V and 4100 4-V

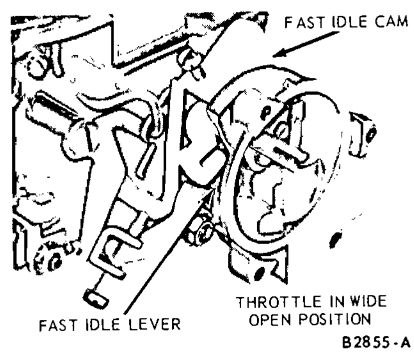


FIG. 20—Dechoke Clearance—Autolite Model 4300 4-V

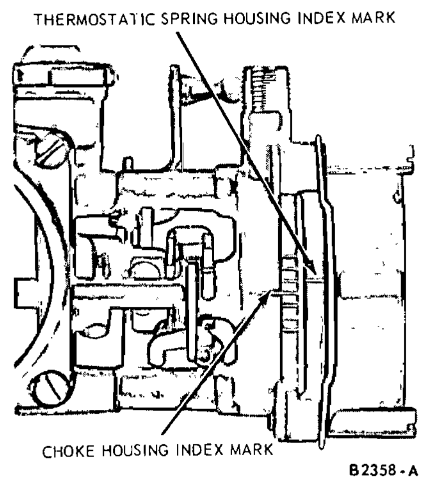


FIG. 21—Automatic Choke Thermostatic Spring Housing Adjustment—Typical

does not permit a wet float setting. The dry float setting is the final setting and is made with the air horn assembly removed from the carburetor.

Autolite Models 2100 2-V and 4100 4-V

The fuel pump pressure and volume must be to specification (Part 10-11) prior to performing the following adjustments.

1. Operate the engine to normalize engine temperatures, and place the vehicle on a flat surface as near level as possible. Stop the engine.
2. Remove the carburetor air cleaner assembly (Part 10-8, Section 2) and anchor screw, if they have not been previously removed.
3. Remove the air horn retaining screws and the carburetor identification tag. Temporarily place the air horn and gasket in position on the carburetor main body and start the engine. Let the engine idle for

several minutes, then rotate the air horn and remove the air horn gasket to provide accessability to the float assembly(ies).

4. While the engine is idling, use a standard depth scale to measure the vertical distance from the top machined surface of the carburetor main body to the level of the fuel in the fuel bowl (Fig. 22). The measurement must be made at least 1/4 inch away from any vertical surface to assure an accurate reading, because the surface of the fuel is concave (higher at the edges than in the center). Care must be exercised to measure the fuel level at the point of contact with the fuel. Refer to the specifications (Part 10-11) for the correct fuel level (wet) setting.

5. If any adjustment is required, stop the engine to minimize the hazard of fire due to fuel spray when the float setting is disturbed. To adjust the fuel level, bend the float tab (contacting the fuel inlet valve) upward in relation to the original position to raise the fuel level, and downward to lower it. Each time an adjustment is made to the float tab to alter the fuel level, the engine must be started and permitted to idle for at least three minutes to stabilize the fuel level. Check the fuel level after each adjustment until the specified level is achieved.

6. Install a new air horn gasket, the air horn assembly, carburetor identification tag and the retaining screws. Tighten the retaining screws. Install the air cleaner anchor screw.

7. Check the idle fuel mixture, idle speed adjustments and the carburetor dashpot (if so equipped). Adjust the carburetor as required.

8. Install the air cleaner assembly (Part 10-8, Section 2),

Holley 4-V

The fuel pump pressure and volume must be to specification prior to performing the following adjustments.

Position the car on a level floor. Be sure the fuel pump pressure is within specifications. Operate the engine until normal operating temperature has been reached. Check the fuel level in each fuel bowl separately. Place a suitable container below the fuel level sight plug to collect any spillover of fuel.

1. With the engine stopped, remove the fuel level sight plug and gasket and check the fuel level (Fig. 23). The fuel level within the bowl should be at the lower edge of the sight plug opening ± 1/16 inch.

2. If the fuel level is satisfactory, install the sight plug. Do not install the air cleaner at this time.

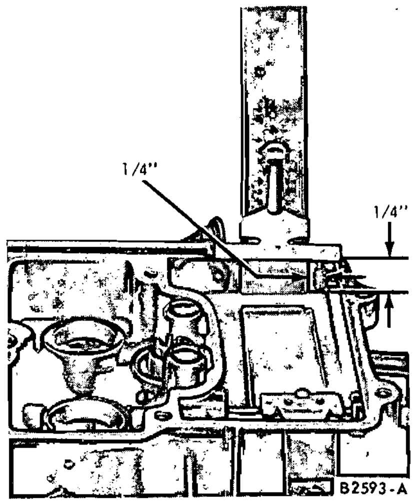


FIG. 22—Fuel Level Float Adjustment (Wet) — Typical For Autolite Models 2100 2-V and 4100 4-V

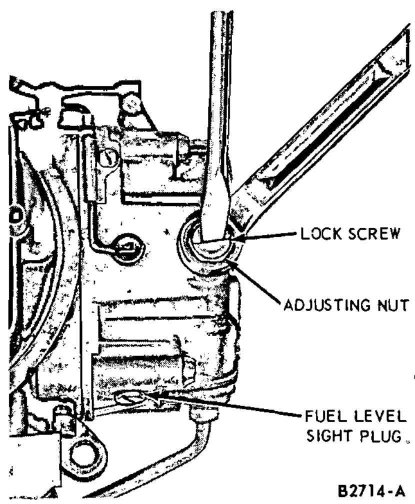


FIG. 23—Fuel Level Float Adjustment (Wet) Holley 4-V

3. If the fuel level is too high, install the sight plug, drain the fuel bowl and refill it and check it again before altering the float setting. **This will eliminate the possibility of foreign material causing a temporary flooding condition.** To drain the fuel bowl, loosen one lower retaining bolt from the fuel bowl and drain the fuel into a suitable container. Install the bolt and the fuel level sight plug, and start the engine to fill the fuel bowl. After the fuel level has stabilized, stop the engine and check the fuel level.

If the fuel level is too high, it should first be lowered below specifications and then raised until it is just at the lower edge of the sight plug opening. If the fuel level is too low, it is only necessary to raise it to the specified level. Follow the procedure under To Lower Fuel Level or To Raise Fuel Level, whichever is applicable.

To Lower Fuel Level.

1. With the engine stopped, loosen the lock screw on top of the fuel bowl just enough to allow rotation of the adjusting nut underneath (Fig. 23). **Do not loosen the lock screw or attempt to adjust the fuel level with the sight plug removed and the engine running because the pressure in the line will spray fuel out and present a fire hazard.**

2. Turn the adjusting nut approximately 1/2 turn in to lower the fuel level below specifications (1/6 turn of the adjusting nut, depending on direction of rotation, will raise or lower the float assembly at the fuel level sight plug opening 3/64 inch).

3. Tighten the lock screw and reinstall the fuel level sight plug. Start the engine. After the fuel level has stabilized, stop the engine and check the fuel level at the sight plug opening. The fuel level should be below specified limits. If it is not, repeat the previous steps, turning the adjusting nut an additional amount sufficient to lower the fuel below the specified level.

4. Loosen the lock screw and turn the adjusting nut out in increments of 1/6 turn or less until the correct fuel level is achieved. After each adjustment, tighten the lock screw, install the fuel level sight plug and then start the engine and stabilize the fuel level. Check the fuel level at the sight plug opening. Install the sight plug and gasket.

5. Check the idle fuel mixture and idle speed adjustments. Adjust the carburetor as required.

To Raise Fuel Level. Perform steps 1, 4 and 5 under the procedure To Lower Fuel Level.

IDLE FUEL MIXTURE AND IDLE (HOT ENGINE) SPEED ADJUSTMENTS

General Procedures

Certain general preparations are necessary to set the idle fuel mixture and idle speed to specifications. **The following instructions apply to all carburetors.** In addition to this general information, specific procedures for each carburetor are given under the applicable title.

Temperature. The engine and underhood temperatures must be stabilized before idle adjustments are made.

On a vehicle with air conditioning, run the engine for 20 minutes with the unit set for maximum cool-

ing before setting the idle speed. Set the idle speed while the air conditioning is in operation.

Parking Brake. Set the parking brake while making idle mixture and speed adjustments. On a vehicle with a vacuum release parking brake, **remove the vacuum line from the power unit of the vacuum release parking brake assembly.** Plug the vacuum line, then set the parking brake. The vacuum power unit must be deactivated to keep the parking brake engaged while the engine is running.

Transmission. On a vehicle with a **manual shift transmission**, check and adjust the engine idle speed only while the gear shift lever is in **neutral** position.

On a vehicle with an **automatic transmission**, check and adjust the engine idle speed first with the transmission selector lever in the **neutral** position, then make a final adjustment with the transmission selector lever in the **drive range** position.

Headlamps. Turn the **headlamps on**. It is necessary to place the alternator under a load condition in order to obtain the specified engine idle speed during the adjustment procedure.

Idle Mixture Adjustment Screws. Initially set the idle mixture by turning the idle mixture screws (needles) inward until they are lightly seated, then turn the screws outward the specified (Part 10-11) turns. **Do not turn the screws tightly against the seats.** If the screw tips are damaged, they must be replaced before a satisfactory fuel-air mixture can be obtained.

Exhaust Emission Control System. When checking or adjusting idle (hot engine) speed on exhaust emission control-equipped engines with a thermal sensing valve in the distributor vacuum line, **the valve must be bypassed**. Disconnect the distributor vacuum hose and manifold vacuum hose at the sensing valve. Plug or pinch-off the manifold vacuum hose; then check or adjust the idle speed in the normal manner.

Turn the idle mixture needle(s) inward until the engine rpm begins to drop, due to the lean mixture, and then turn the needle(s) outward 1/4 turn. The outward adjustment of the idle fuel mixture needle(s) is the final fuel mixture adjustment required.

On vehicles without the Thermactor system, turn the idle mixture needle(s) inward for maximum rpm and engine smoothness. Always favor a slightly rich mixture.

Dashpot. Be sure the dashpot (if so equipped) is not interfering with the throttle lever or the fast idle screw is not contacting the fast idle cam.

It may be necessary to back off on the dashpot adjustment screw to seat the throttle plate in the throttle bore.

Hot Idle Compensator. On carburetors equipped with a hot idle compensator, be sure the compensator is seated to allow for proper idle adjustment.

INITIAL IDLE SPEED AND FUEL MIXTURE ADJUSTMENTS

1. **Refer to the General Procedures** for idle speed and mixture adjustment instructions common to all carburetors.

2. Set the idle mixture adjusting screw(s) for the initial idle mixture (Part 10-11).

3. Set the choke plate to full-open position. Loosen the adjusting screw to fully seat the throttle plate(s) in the throttle bore.

On the **Autolite Model 1100 1-V**, Fig. 24, set the idle speed adjusting screw to just make contact with the stop on the carburetor lower body; then, turn the screw inward the specified turns (Part 10-11).

On the **Carter Model YF 1-V** turn the idle mixture screw (Fig. 25) inward until the engine rpm begins to drop, due to the lean mixture. Turn the idle mixture screw outward until the rpm increases and begins to drop.

On the **Autolite Models 2100 2-V and 4100 4-V** (Fig. 26) set the idle speed adjusting screw to just make contact with the throttle lever; then turn the screw inward the specified turns (Part 10-11).

On the **Autolite Model 4300 4-V**, (Fig. 27) turn the idle air adjusting screw inward until it lightly seats; then turn the screw outward the specified turns (Part 10-11).

On the **Holley 4-V**, (Fig. 28) turn the idle speed adjusting screw **inward to increase** and **outward to decrease** the speed. Be sure the fast idle screw is not touching the fast idle cam when making this adjustment.

Turn the idle (hot engine) speed adjusting screw outward until the throttle plates close tight in the throttle bores. It may be necessary to back out the fast (cold engine) idle adjusting screw to close the plates in the throttle bores. Set the idle speed adjusting screw to just make contact with the lever on the primary throttle shaft; then turn the screw inward the specified turns (Part 10-11).

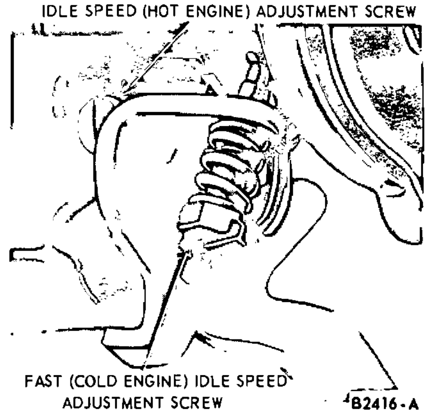


FIG. 24—Idle Speed Adjustments — Autolite Model 1100 1-V

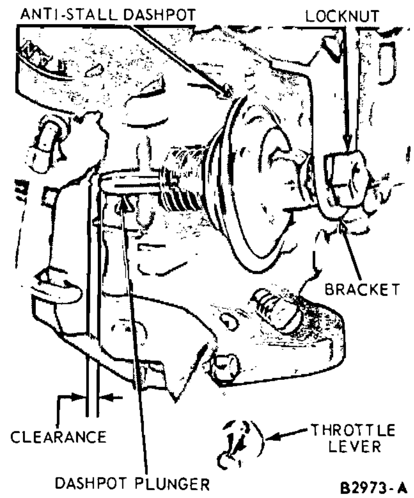


FIG. 25—Anti Stall Dashpot Adjustments—Carter Model YF 1-V

FINAL IDLE (HOT ENGINE) SPEED AND MIXTURE ADJUSTMENTS

In addition to the initial idle settings, the engine idle speed is finally adjusted to settings for a **hot engine** and for a **cold engine** (fast idle speed during choke operation).

1. Refer to the **General Procedures** for idle speed and mixture adjustments instructions common to all carburetors.

2. Final adjustments are made with the engine running and the engine and underhood temperatures stabilized. Install a tachometer to make the final adjustments. Refer to Part 10-11 for the specified curb idle rpm.

3. Turn the idle mixture adjusting screw(s) inward until the engine rpm begins to drop due to the lean mixture, and then turn the screws outward until the engine rpm begins

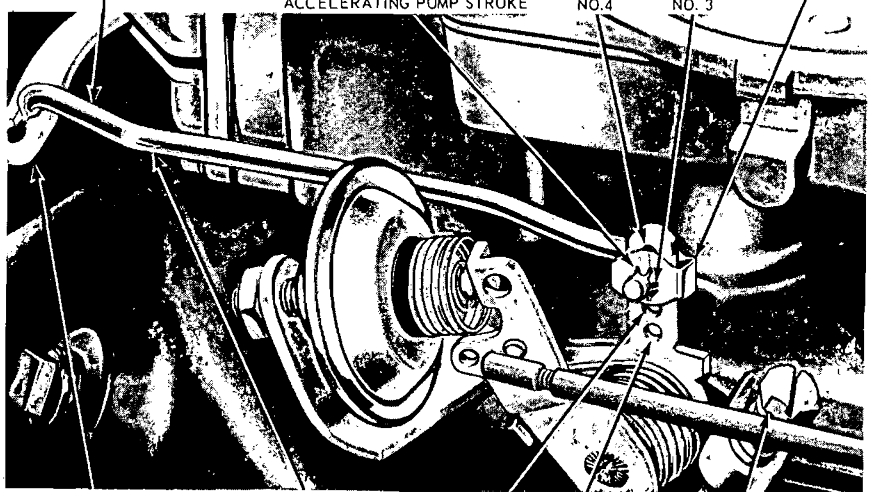


FIG. 26—Accelerating Pump Stroke and Idle (Hot Engine) Speed Adjustments— Typical for Autolite Models 2100 2-V and 4100 4-V

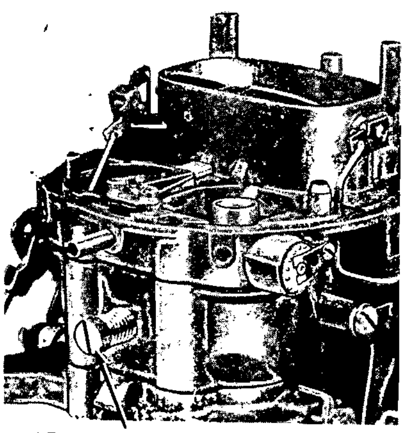


FIG. 27—Idle Air Adjusting Screw —Autolite Model 4300 4-V

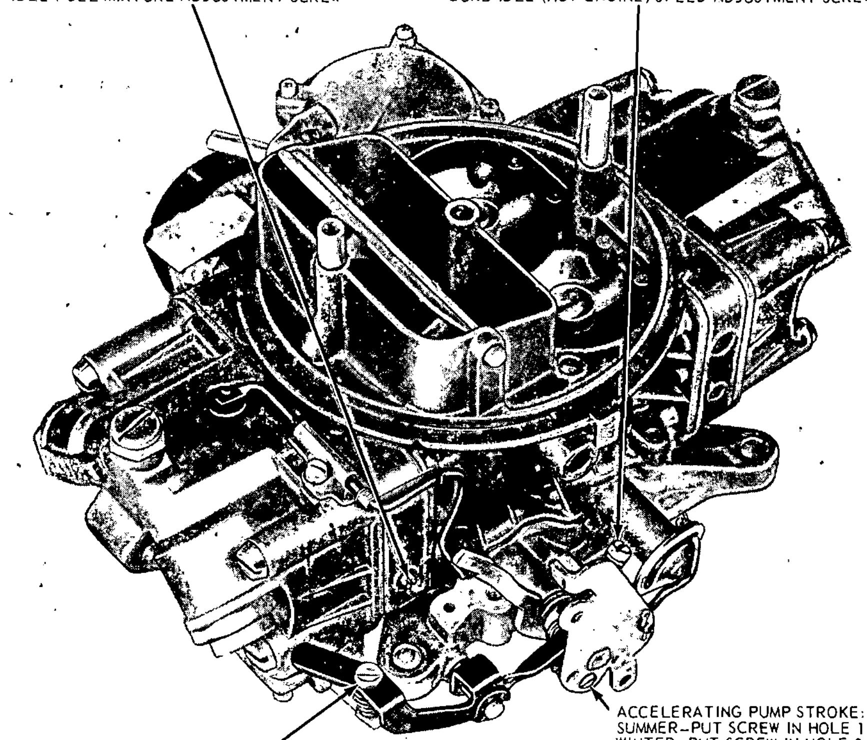


FIG. 28—Accelerating Pump, Idle Fuel Mixture and Idle (Hot Engine) Speed Adjustments — Holley

to drop due to rich mixture. Finally, turn the screw(s) inward for maximum engine rpm and smoothness. Turn the screws evenly and alternately approximately the same amount.

On **Autolite 2-V and 4-V carburetors,** the final setting may vary about 1/2 turn difference between screws.

On the **Carter YF Type 1-V carburetor**, turn the idle mixture screw inward approximately half way between the lean mixture and rich mixture settings.

4. On the **Autolite Model 4300 4-V carburetor**, recheck the idle speed. If it has changed, readjust the air bypass screw as required to correct the idle speed. Then, repeat step 3. The idle mixture screws must be re-adjusted every time the idle speed screw is adjusted in order to achieve optimum idle quality.

On the **Holley 4-V carburetor**, final adjustment of the idle fuel mixture screws should be within 1/8 turn of each other.

FAST (COLD ENGINE) IDLE SPEED ADJUSTMENT

Autolite and Holley Carburetors

The fast idle adjusting screw (Figs. 24, 29 and 30) contacts one edge of the fast idle cam. The cam permits a faster engine idle speed for smoother running when the engine is cold during choke operation. As the choke plate is moved through its range of travel from the closed to the open position, the fast idle cam pick-up lever rotates the fast idle cam. Each position on the fast idle cam permits a slower idle rpm as engine temperature rises and choking is reduced.

Make certain the idle (hot engine) speed and mixture is adjusted to specification before attempting to set the fast idle speed.

1. With the engine operating temperature normalized (hot), air cleaner removed and the tachometer attached, manually rotate the fast idle cam until the fast idle adjusting screw rests adjacent to the shoulder

of the highest step (screw aligned with arrow mark) on the cam.

2. Start the engine, and turn the fast idle adjusting screw inward or outward as required to obtain the specified idle rpm (Part 10-11).

Carter Model YF 1-V Carburetor

The carburetor must be removed from the engine to check or correct the fast idle speed adjustment.

1. Open the throttle plate and hold the choke plate fully closed to allow the fast idle cam (Fig. 31) to revolve to the fast idle position.

2. Close the throttle and use a drill with a diameter equal to the specified clearance to check the clearance between the throttle plate and throttle body bore (Fig. 31). To adjust the clearance, bend the choke connector rod in a direction to open or close the throttle as required.

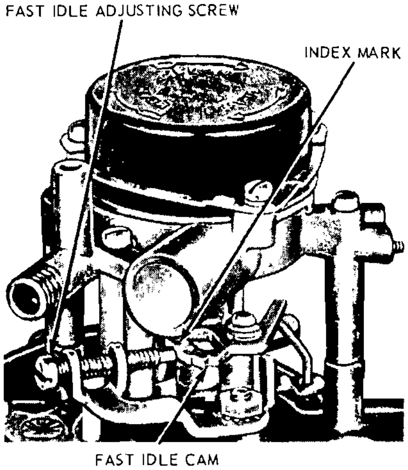


FIG. 29—Fast (Cold Engine) Idle Speed Adjustment — Autolite Models 2100 2-V and 4100 4-V

METERING ROD ADJUSTMENT — CARTER MODEL YF 1-V CARBURETOR

1. Remove the carburetor air horn and gasket from the carburetor. Refer to Air Horn to Main Body Gasket Replacement in this section for the proper procedure.

2. With the throttle plate closed, press down on the end of the diaphragm shaft (Fig. 32), until it bottoms in the vacuum chamber. Check the position of the metering rod. It should be touching the bottom of the metering rod well, and the metering rod arm should contact the lifter link at

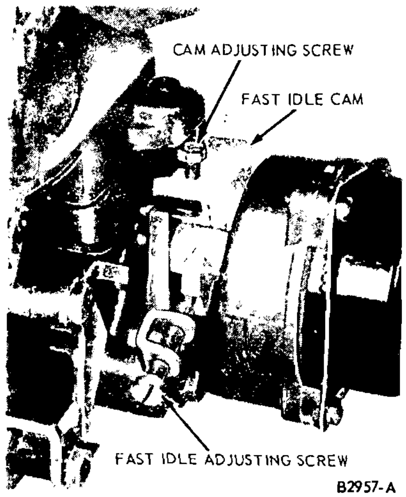


FIG. 30—Fast Idle (Cold Engine) Speed Adjustment — Autolite Model 4300 4-V

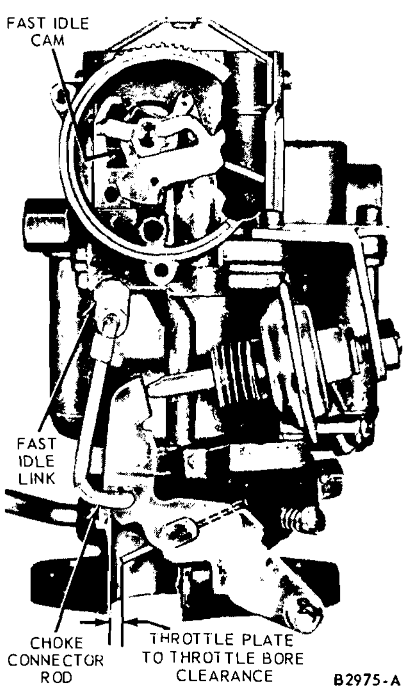


FIG. 31—Fast Idle Speed Adjustment — Carter Model YF 1-V

the lifting lug and at the diaphragm shaft.

3. If necessary, bend the metering rod pin flange (on the metering rod arm) up or down to properly position the metering rod.

4. Install the carburetor air horn and a new gasket on the carburetor. Refer to Carburetor Air Horn to Main Body Gasket Replacement (in this section) for the proper procedure.

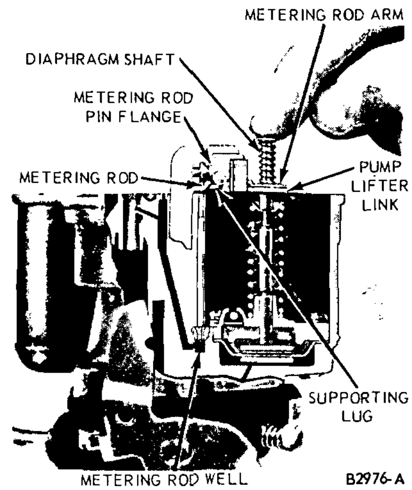


FIG. 32—Metering Rod Adjustment — Carter Model YF 1-V

ANTI-STALL DASHPOT (AUTOMATIC TRANSMISSIONS)

The anti-stall dashpot adjustment is made with the air cleaner removed (Part 10-8, Section 2) from the vehicle.

Autolite Model 1100 1-V

1. Adjust the throttle position to the hot idle setting. Turn the dashpot adjusting screw outward until it is clear of the dashpot plunger assembly (Fig. 33).

2. Turn the dashpot adjusting screw inward until it initially contacts the dashpot plunger assembly; then, turn the adjusting screw inward (clockwise) the specified (Part 10-11) number of turns against the dashpot diaphragm plunger assembly.

3. Check the accelerating pump lever and stroke for proper adjustment. Install the air cleaner.

Carter Model YF 1-V

The engine idle mixture speed must be properly adjusted before adjusting the anti-stall dashpot.

1. Remove the air cleaner.

2. Loosen the anti-stall dashpot lock nut (Fig. 25).

3. With the choke plate open, hold the throttle plate closed (idle position), and check the clearance between the throttle lever and dashpot plunger tip with a feeler gauge of the specified clearance dimension. Turn the dashpot inward or outward to obtain the specified clearance and tighten the lock nut. **The clearance must be measured with the plunger fully depressed.**

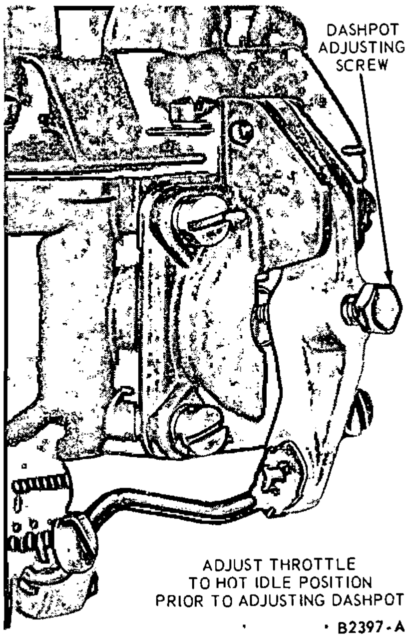


FIG. 33—Anti-Stall Dashpot Adjustment — Autolite Model 1100 1-V

Autolite 2-V and 4-V

1. With the engine idle speed and mixture properly adjusted, and the engine at normal operating temperature, loosen the anti-stall dashpot lock nut (Fig. 34).

2. Hold the throttle in the closed position and depress the plunger with a screwdriver blade. Check the clearance between the throttle lever and the plunger tip with a feeler gauge of the specified clearance dimension (Part 10-11). Turn the anti-stall dashpot in a direction to provide the specified clearance between the tip of the plunger and the throttle lever. Tighten the locknut to secure the adjustment.

3. Check the accelerating pump stroke for proper adjustment, if required. Install the air cleaner assembly (Part 10-8, Section 2).

ACCELERATING PUMP ADJUSTMENTS

Acceleration requirements in various climates are satisfied by controlling the amount of fuel discharged by the accelerating pump. This is accomplished by adjusting the pump clearance to specification; then, adjusting the pump stroke to suit the ambient temperature in which the vehicle is to be operated.

An **accelerating pump clearance or stroke adjustment** is not required on

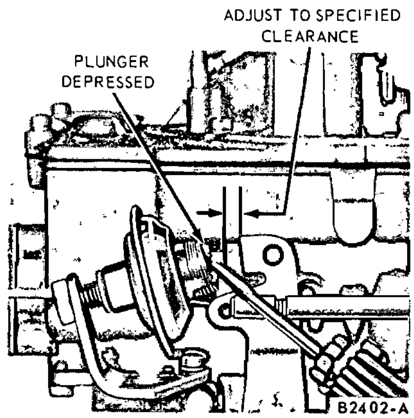


FIG. 34—Anti-Stall Dashpot Adjustment—Typical For Autolite 2-V and 4-V

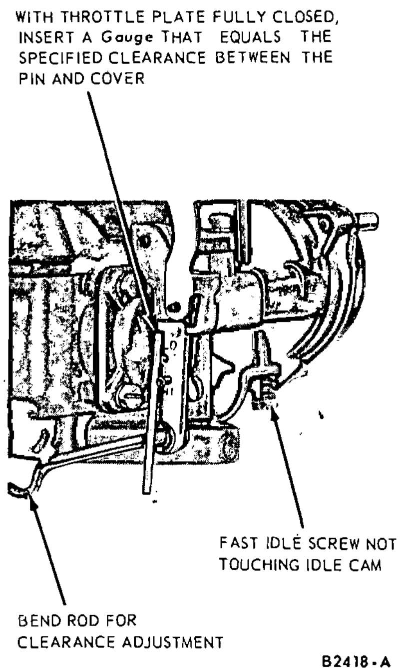


FIG. 35—Accelerating Pump Clearance Adjustment — Autolite Model 1100 1-V

the Carter YF Type 1-V carburetor. An **accelerating pump clearance adjustment** is not required on Autolite 2-V or 4-V carburetors.

The accelerating pump adjustments are performed with the carburetor air cleaner removed from the vehicle (Part 10-8, Section 2).

Accelerating Pump Clearance Autolite Model 1100 1-V

1. Insert the roll pin in the lower hole position in the lever (Fig. 35).

2. Position the throttle and choke linkage so that the throttle plate will seat in the throttle bore. Hold the throttle plates in the closed position. Position a gauge or drill of the specified thickness (Part 10-11) between the roll pin and the cover surface. Bend the accelerating pump actuating rod to obtain the specified gauge or drill clearance between the pump cover and the roll pin in the pump lever (Fig. 35).

Accelerating Pump Clearance—Holly 4-V

Using a feeler gauge and with the primary throttle plates in the wide open position, there should be the specified (Part 10-11) clearance between the accelerating pump operating lever adjusting screw head and the pump arm when the pump arm is fully depressed manually (Fig. 28). Turn the adjusting screw in to increase the clearance and out to decrease the clearance. One-half turn of the adjusting screw is equal to 0.015 inch.

Accelerating Pump Stroke—Autolite Model 1100 1-V

The pump stroke is controlled by changing location of the roll pin in the lever stop hole (Fig. 36).

1. For operation in ambient temperatures 50° F. and below, place the roll pin in the lever lower hole.

For best performance and economy at normal ambient temperatures and high altitude (above 50° F and/or above 5,000 feet altitude), place the roll pin in the upper hole of the lever.

2. Check the vent valve for proper adjustment.

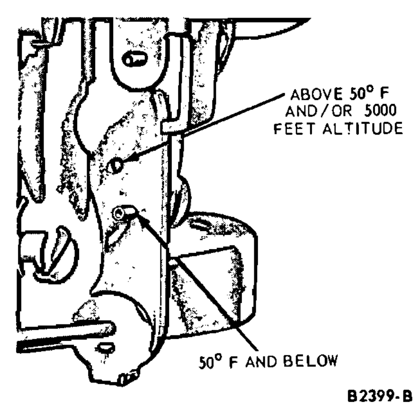


FIG. 36—Accelerating Pump Stroke Adjustment—Autolite Model 1100 1-V

Accelerating Pump Stroke—Autolite Models 2100 2-V and 4100 4-V

The primary throttle shaft lever (overtravel lever) has 4 holes and the accelerating pump link has 2 holes (Fig. 26) to control the accelerating pump stroke for various ambient temperatures and operating conditions of the engine.

The accelerating pump operating rod should be in the specified (Part 10-11) hole in the overtravel lever and the inboard hole (hole closest to the pump plunger) in the accelerating pump link (Fig. 26).

1. To release the rod from the retainer clip, press the tab end of the clip toward the rod; then, at the same time, press the rod away from the clip until it is disengaged.
2. Position the clip over the specified (Part 10-11) hole in the overtravel lever. Press the ends of the clip together and insert the operating rod through the clip and the over-travel lever. Release the clip to engage the rod.

Accelerating Pump Stroke—Autolite Model 4300 4-V

The accelerating pump stroke (Fig. 37) has been calibrated to inject a predetermined quantity of fuel into the air stream with the pump pivot pin in the specified hole. The amount of fuel injected into the air stream may be altered by moving the pivot pin to the left hole or (#2) to decrease the fuel quantity or to the right holes (#2 or #3) to increase the fuel quantity.

If it is necessary to vary the setting, the pump stroke can be altered as follows:

1. Remove the pump pivot pin retainer. Remove pivot pin.
2. Insert the pivot pin into the desired hole.

The holes in the fuel bowl vent lever, main body casting and the pump lever must be in line.

3. Install the pivot pin retainer. Position the pump rod end into the pump arm and install the retainer.
4. Adjust the vent valve clearance (Fig. 38).

Accelerating Pump Stroke—Holley 4-V

To satisfy acceleration requirements in various climates, the accelerating pump discharge can be adjusted. The bottom hole (No. 2) in the cam provides a maximum pump discharge for extreme cold weather

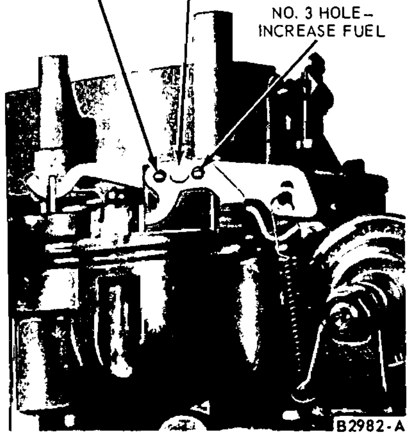


FIG. 37—Accelerating Pump Stroke Adjustment — Model 4300 4-V

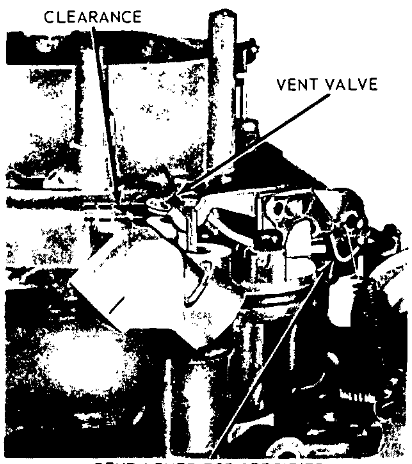


FIG. 38—Fuel Bowl Vent Valve Adjustment—Model 4300 4-V

and the top hole (No. 1) provides the minimum pump discharge for warm weather operation (Fig. 28).

For summer operation, install the adjustment screw in hole NO. 1. For winter operation, install the adjustment screw in hole NO. 2.

VENT VALVE ADJUSTMENT—

Autolite Model 1100 1-V

The vent valve adjustment is always performed after the accelerating pump adjustment has been completed.

1. With the air cleaner removed, set the throttle linkage to the hot idle position. The groove in the vent valve rod should now be even with the open end of the vent (Fig. 39). Bend the arm on the vent valve rod

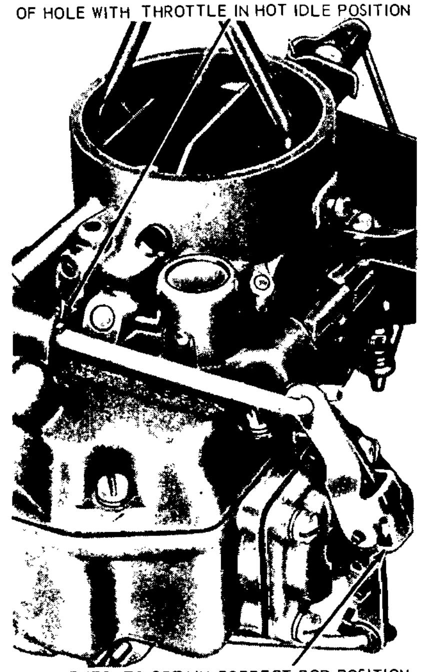


FIG. 39—Fuel Bowl Vent Valve Adjustment—Autolite Model 1100

actuating lever (where it contacts the accelerating pump lever) to align the groove with the edge of the bore.

2. Install the air cleaner (Part 10-8, Section 2).

Autolite Model 4300 4-V

The fuel bowl vent valve (Fig. 38) must be adjusted to the specified clearance. The adjustment can be made with the carburetor on or off the engine.

1. Set the throttle plates in the closed position.
2. Check the clearance between the vent valve and the valve seat (refer to specifications).
3. If it is necessary to reset the clearance, bend the end of the vent valve lever downward to decrease the clearance or upward to increase the clearance.

Holley 4-V

The fuel bowl vent clearance must be adjusted whenever the accelerating pump lever and/or accelerating pump stroke adjustments are performed. A change in the accelerating pump adjustments will affect the fuel bowl vent valve clearance.

1. With the engine temperature stabilized and the engine operating at curb (hot engine) idle speed, check

the clearance between the bottom of the rubber vent valve and the top of the fuel bowl at the vent opening (Fig. 40).

If the clearance is not within specifications (Part 10-11) bend the vent rod to obtain the specified clearance (Fig. 40).

THROTTLE LINKAGE ADJUSTMENT

Manual-Shift Transmissions

The engine idle speed and fuel mixture (Part 10-1, Section 2) must be adjusted to specification prior to performing throttle linkage adjustments.

On vehicles equipped with a bellcrank stabilizer, it will be necessary to perform a bellcrank stabilizer adjustment before adjusting the throttle (accelerator) linkage.

Views of the throttle (accelerator) linkage for the various vehicle models are shown in Figs. 41 through 46.

Bellcrank Stabilizer Adjustment —Fairlane and Mercury Intermediate 289 and 390 V-8. Refer to Figs. 45 or 46 for views of the bellcrank stabilizer for the applicable car model(s).

The bellcrank stabilizer must be properly adjusted prior to adjusting the carburetor throttle (accelerator) linkage.

1. Disconnect the retaining clip and bell crank stabilizer clevis from the bellcrank assembly.

2. Insert a 1/4 inch adjustment pin (fabricated out of cold rolled steel through the adjustment holes in the bellcrank assembly. Adjust the bellcrank stabilizer clevis so that it centers (fits freely) in the bore of the bellcrank.

3. Connect the retaining clip and bellcrank stabilizer clevis to the bellcrank. Secure the stabilizer into position with the retaining clip. Make sure the clip is positioned securely. Remove the adjustment pin.

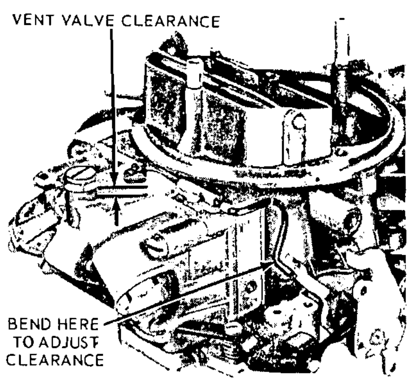


FIG. 40—Fuel Bowl Vent Clearance Adjustment — Holley 4-V

Accelerator Pedal Idle Height Adjustment

Mustang Six. Refer to Fig. 41 for a view of the accelerator linkage and the accelerator pedal specified idle height for the car model.

1. Adjust the idle (hot engine) speed (Part 10-1, Section 2) to specification (Part 10-11), if required.

2. With the engine stopped, make sure the carburetor choke plate is fully opened and the carburetor throttle plate is fully closed. **Be sure the fast idle cam is not contacting the fast idle screw.**

3. Check the accelerator pedal for the specified idle height. **Make sure the floor mat is properly positioned when performing this operation.**

4. If the pedal height requires adjustment, disconnect the accelerator retracting spring and return spring at the accelerator shaft. Disconnect the accelerator control shaft rod at the carburetor accelerator shaft lever.

5. With the carburetor throttle plate closed, adjust the accelerator control shaft rod assembled length to obtain the specified accelerator pedal idle height.

6. Connect the accelerator control shaft rod so that it centers over the retaining ball stud on the carburetor accelerator shaft lever. **Make sure it is secure.** Install the return spring and accelerator retracting spring.

All Models Except Mustang Six. Refer to Figs. 42 through 46 for views of the accelerator linkage and the accelerator pedal specified idle height for the applicable car model(s):

1. Adjust the idle (hot engine) speed (Part 10-1, Section 2) to specification (Part 10-11), if required.

2. With the engine stopped, make sure the carburetor choke plate is fully opened and the throttle plate(s) is closed. **Be sure the fast idle cam is not contacting the fast idle screw.**

3. Check the accelerator pedal for the specified idle height. **Make sure the floor mat is properly positioned when performing this operation.**

4. If the pedal height requires adjustment, disconnect the accelerator retracting spring at the accelerator shaft or bellcrank (if so equipped). Disconnect the accelerator shaft at the carburetor throttle lever or accelerator bellcrank lever, if so equipped.

5. With the throttle plate(s) closed, lengthen or shorten the assembled length of the accelerator shaft to bellcrank rod to obtain the accelerator pedal specified height.

6. Install the retaining clip and connect the accelerator shaft to bellcrank rod at the carburetor throttle lever or accelerator bellcrank lever, if so equipped. **Make sure the clip is properly seated.** Install the accelerator retracting spring.

Automatic Transmission

The throttle linkage adjustments for the automatic transmissions are covered in Group 7.

CARBURETOR REPAIRS

AIR HORN TO MAIN BODY GASKET REPLACEMENT AUTOLITE MODEL 1100 1-V

Removal

1. Remove the air cleaner assembly (Part 10-8, Section 2).

2. Remove the fuel filter from the carburetor.

3. Depress the tab on the retaining clip that secures the fuel bowl vent rod to the actuating lever, and remove the rod and the retainer from the lever.

4. Remove the air horn to lower body retaining screws and the carburetor identification tag.

5. Tilt the fuel bowl vent side of the upper body to allow clearance between the float assembly and the lower body, using a twisting motion to disconnect the choke plate lever from the actuating rod. Remove and discard the gasket.

Installation

1. Install a new gasket on the carburetor lower body. **Make sure all holes in the new gasket have been punched and that no foreign material has adhered to the gasket. Make certain the word Top (inscribed on the gasket) is facing upward.**

2. Insert the choke plate lever actuating rod through the choke plate lever. Use a twisting motion to position the carburetor air horn on the mounting gasket. **During the installation, observe the float shaft to make certain it does not dislodge.** Install the upper to lower body

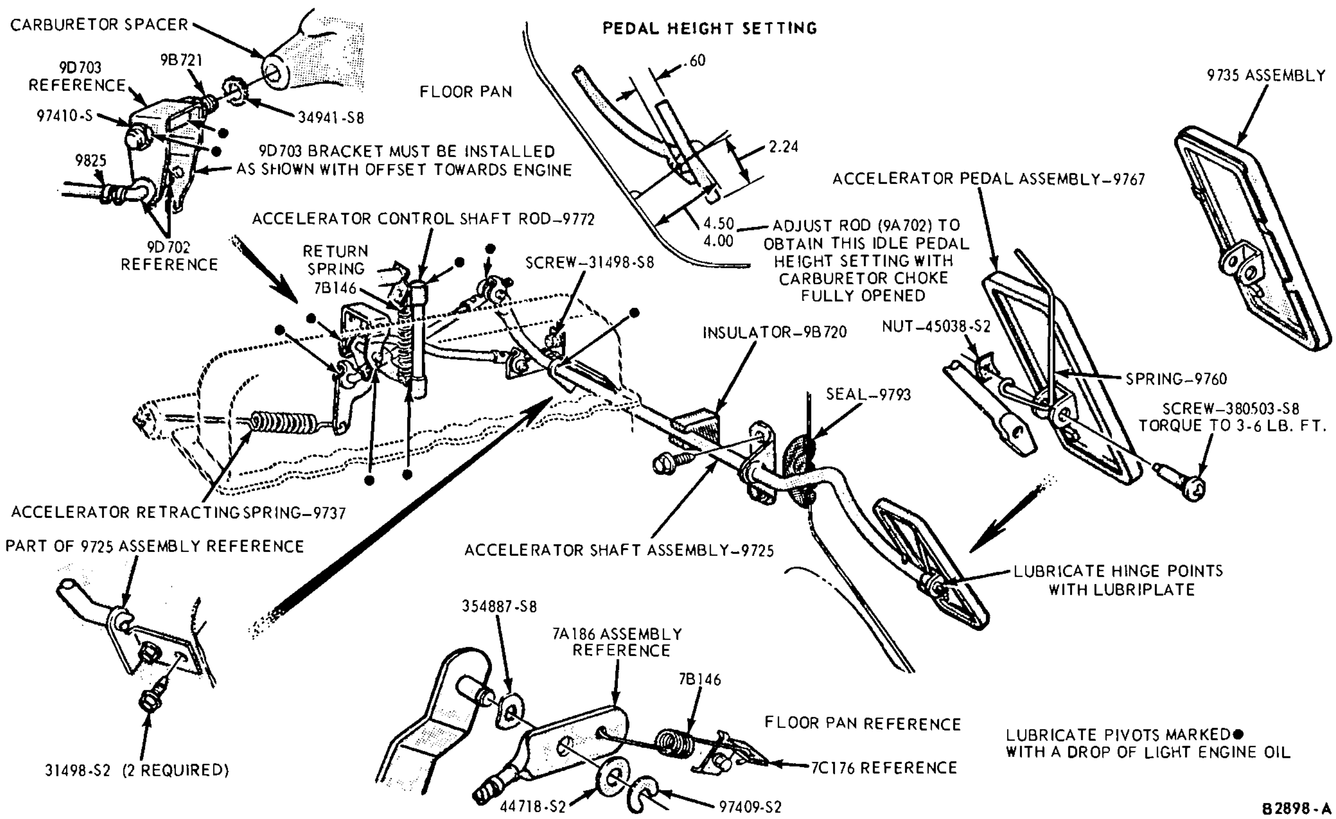


FIG. 41—Throttle Linkage Adjustment—Mustang Six

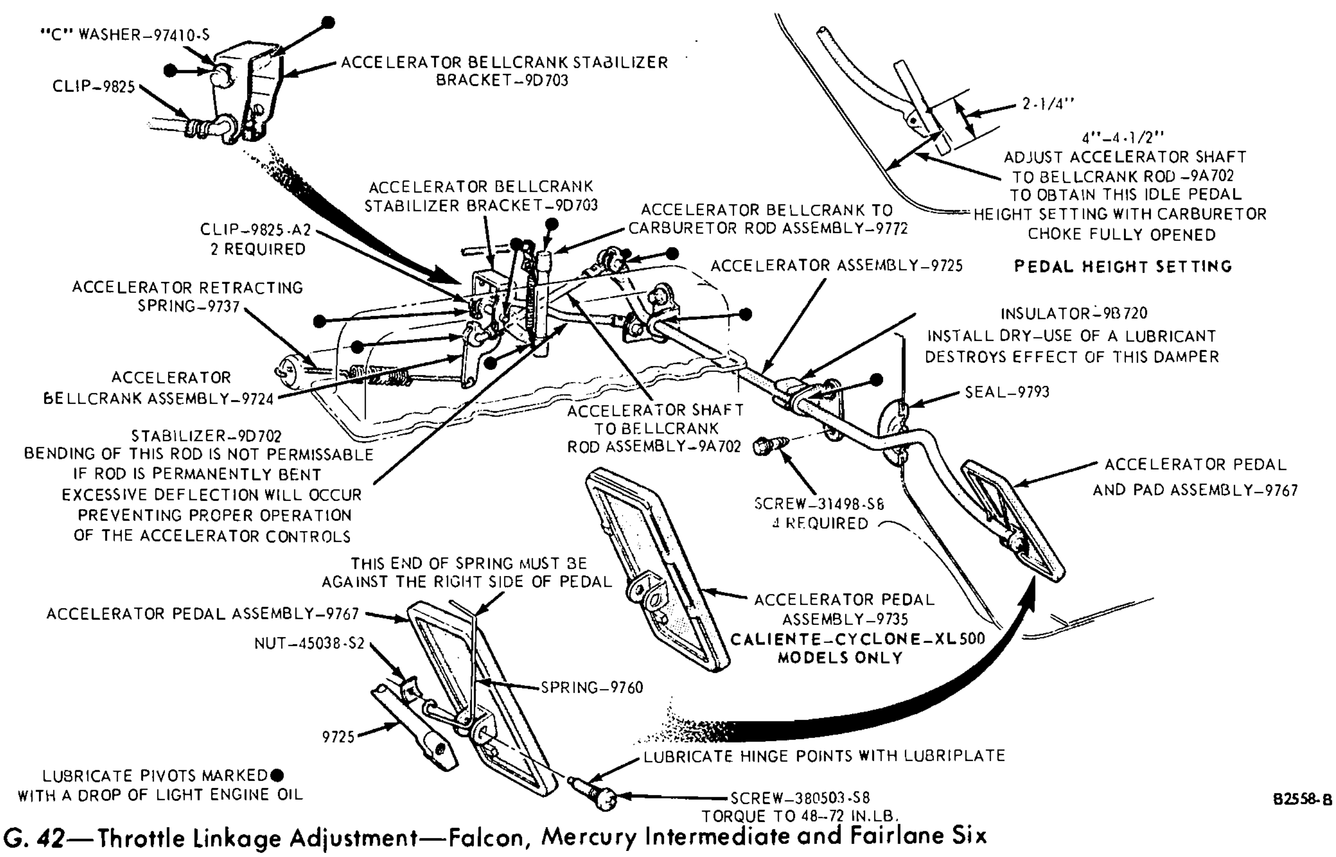


FIG. 42—Throttle Linkage Adjustment—Falcon, Mercury Intermediate and Fairlane Six

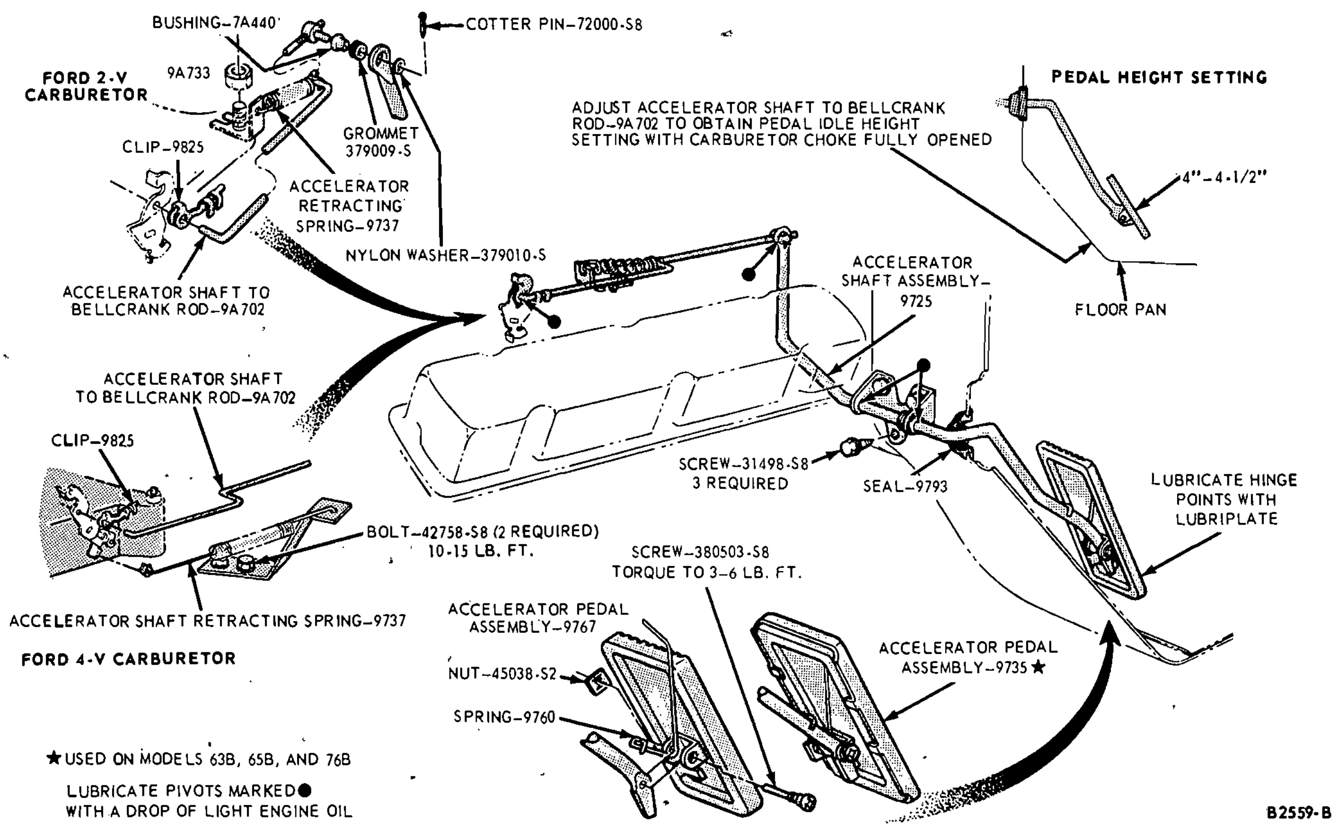


FIG. 43—Throttle Linkage Adjustment—Mustang and Cougar V-8

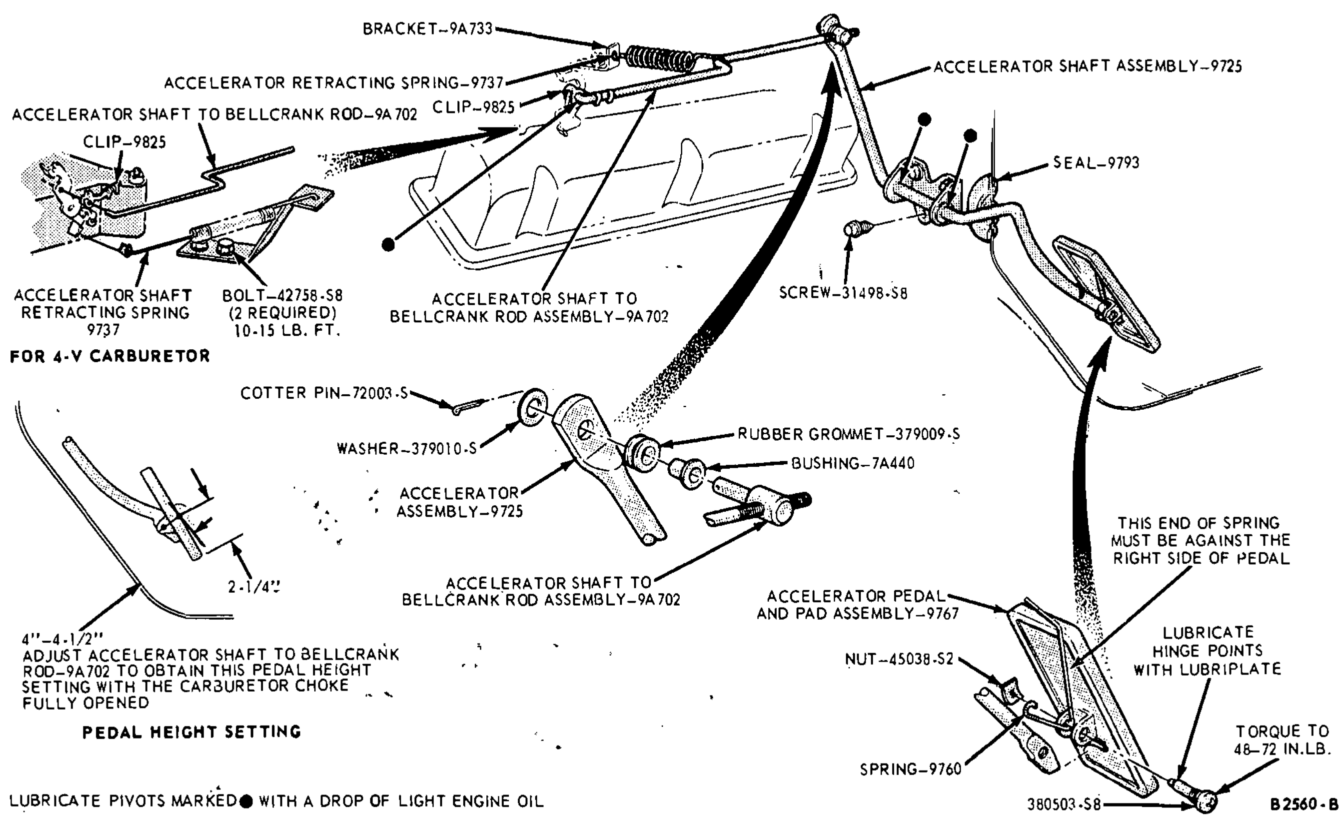


FIG. 44—Throttle Linkage Adjustment—Falcon V-8

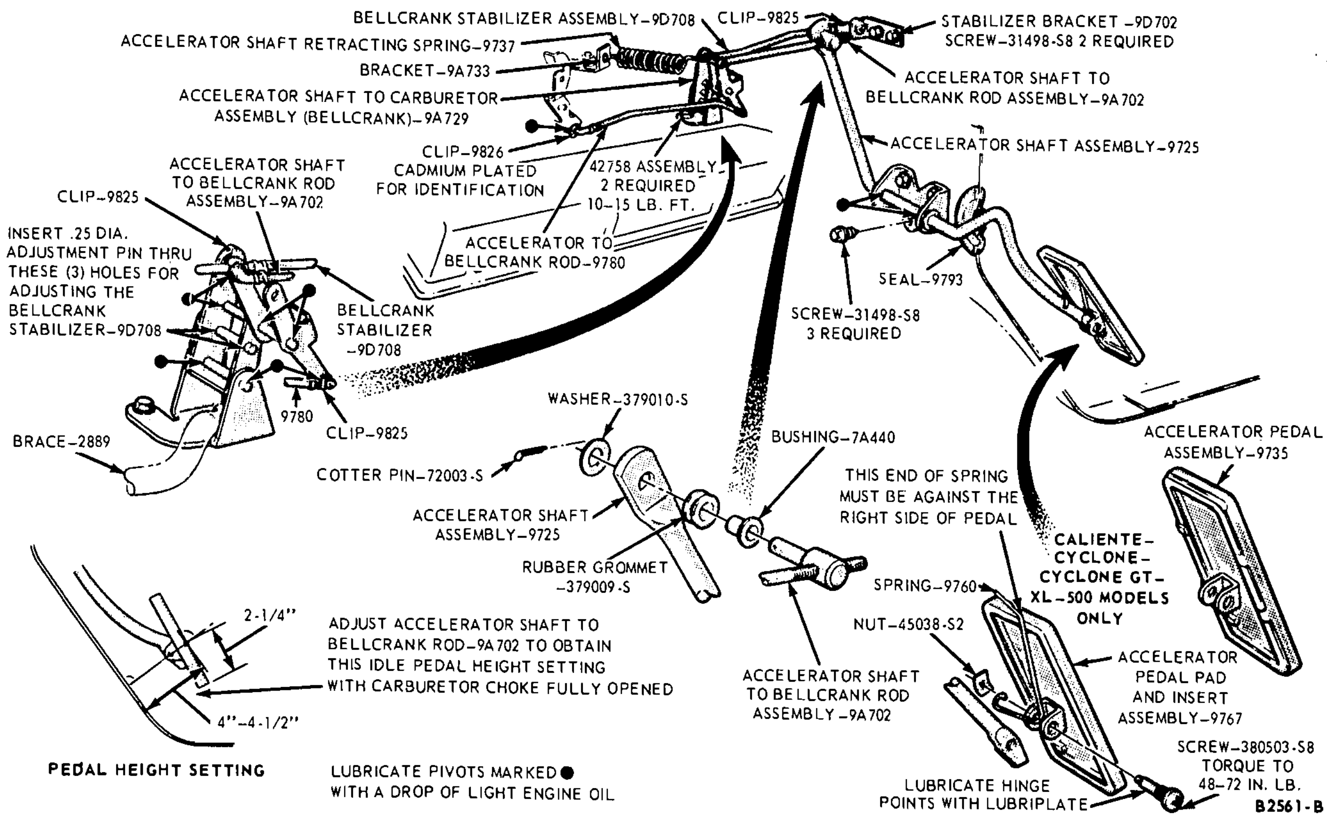


FIG. 45—Throttle Linkage Adjustment—Fairlane and Mercury Intermediate 289 V-8

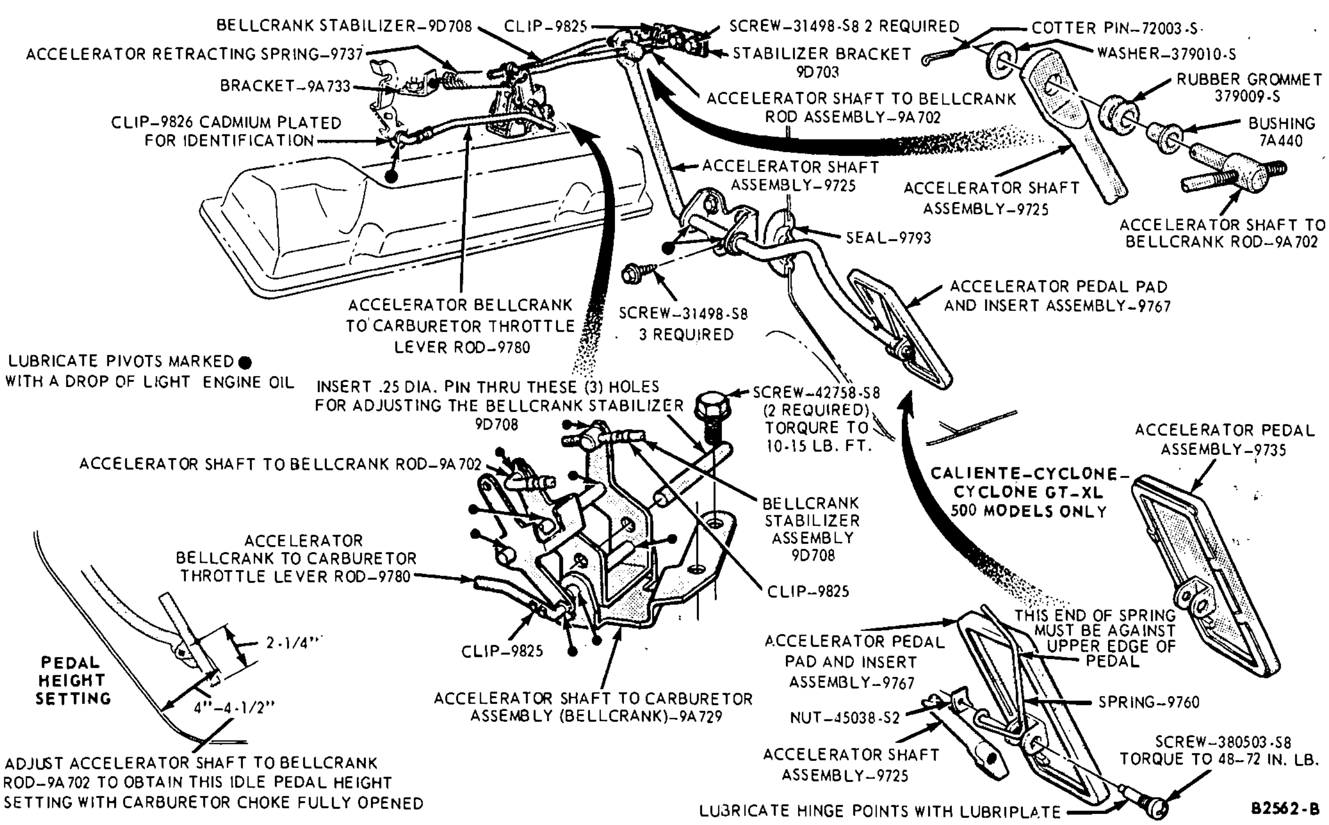


FIG. 46—Throttle Linkage Adjustment—Fairlane and Mercury Intermediate 390 V-8

retaining screws and the carburetor identification tag. Tighten the screws.

3. Position the fuel bowl vent rod retaining clip on the vent rod actuating lever. Depress the tab on the retaining clip and install the vent rod in the clip and the lever. Release the tab.

4. Connect the fuel filter and inlet line to the carburetor.

5. Adjust the idle fuel mixture and engine idle speed as outlined in this section.

Carter Model YF 1-V

Removal

1. Remove the air cleaner.

2. Disconnect the choke heat tube at the carburetor air horn. Disconnect the fuel inlet line at the carburetor.

3. Disengage the throttle connecting rod retainer from the choke connector rod, and pull the rod out of the fast idle link. Remove the air horn assembly attaching screws, dashpot and bracket assembly and air horn gasket. Discard the gasket.

Installation

1. Install a new air horn to main body gasket. **Make sure all holes in the new gasket have been properly punched and that no foreign material has adhered to the gasket.** Install the air horn assembly, dashpot and bracket assembly and air horn attaching screws. Insert the end of the choke connector rod in the fast idle link, and secure it with the throttle connector rod retainer.

2. Connect the fuel inlet line and choke heat tube to the carburetor air horn.

3. Install the air cleaner. Start the engine and run it until normal operating temperature is reached. Adjust the idle fuel mixture and idle speed.

Autolite Models 2100 2-V and 4-V

Removal

1. Remove the air cleaner assembly (Part 10-8, Section 2). Remove the air cleaner anchor screw.

2. Disconnect the automatic choke clean air tube at the carburetor.

3. Remove the automatic choke plate operating rod to choke lever retainer.

4. Remove the air horn retaining screws and lock washers, and the carburetor identification tag. Remove the airhorn gasket.

Installation

1. Install a new air horn to main body gasket. **Make sure all holes in the new gasket have been properly punched and that no foreign material has adhered to the gasket.**

2. Position the air horn on the main body and gasket so that the choke plate operating rod fits into the opening in the choke housing lever. Install the choke plate rod retainer. **On the model 4100 4-V carburetor, use care to prevent damage to the secondary throttle control vacuum tubes during the air horn installation.**

3. Install the air horn retaining screws and lock washers and the identification tag. Install the air cleaner anchor screw.

4. Connect the automatic choke clean air tube to the carburetor.

5. Adjust the idle fuel mixture and idle speed and the dashpot as outlined in this section.

6. Install the carburetor air cleaner assembly (Part 10-8, Section 2).

Autolite Model 4300 4-V

Removal

1. Remove the air cleaner assembly.

2. Disconnect the fuel inlet line from the air horn.

3. Remove the choke clean air pickup tube (if so equipped) from the air horn.

4. Remove the choke control rod retainer from the automotic choke lever. Separate the rod from the lever.

5. Remove the accelerator pump rod retainer from the pump rod. Separate the rod from the throttle lever.

6. Remove the air cleaner stud and the air horn to main body retaining screws (one of the screws retains the fuel bowl external vent valve), and the carburetor identification tag.

7. Lift the air horn off the fuel bowl.

8. Remove the gasket.

Installation

1. Install a new air horn to main body gasket. **Make sure all holes in the new gaskets have been properly punched and that no foreign material has adhered to the gasket.** Gasket surfaces must be clean and flat and free of nicks or burrs.

2. Carefully position the air horn assembly over the main body. Guide the accelerator pump plunger and the secondary throttle dashpot piston into their chambers as the air horn is gently lowered into position.

3. Install the longest of the air horn retaining screws in the left rear hole.

4. Slide the fuel bowl vent valve into position under the accelerator pump lever. Position the vent valve support on the vent valve arm and install the retaining screw.

5. Install the other air horn retaining screws and the carburetor identification tag.

6. Insert the key end of accelerator pump control rod into the keyed hole in the primary throttle lever. Insert the other end of the rod into the pump lever and install retainer.

7. Insert the choke control rod end into the automatic choke lever. With long nose pliers, install the retainer.

8. Check the fuel bowl vent valve clearance (Fig. 42).

9. Connect the fuel inlet line.

10. Connect the choke clean air pickup and heat tubes (if so equipped).

11. Install the air cleaner.

12. Adjust the idle fuel mixture and engine idle speed as outlined in this section.

FLOAT OR NEEDLE VALVE REPLACEMENT

Autolite Model 1100 1-V

1. Remove the carburetor air horn and gasket by following the instructions under Air Horn to Main Body Gasket Replacement in this section.

2. Remove the carburetor float shaft and float assembly.

3. If necessary, remove the fuel inlet needle valve, seat and gasket. Discard the gasket.

4. If the needle valve and seat were removed, install the new gasket and the needle valve seat. Tighten the seat with a wrench. Insert the needle valve into the bore, with the viton tip toward the seat.

5. Position the float assembly in the air horn, with the tab on the arm located over the needle valve and the hinge of the arm lined up between the hinge bracket holes in the casting. Insert the float shaft through the holes in the upper body and float assembly.

6. Check the float setting. Refer to Float Adjustment—Dry in this section.

7. Install the carburetor air horn and gasket by following the instructions under Carburetor Air Horn to Main Body Gasket Replacement in this section.

Carter Model YF 1-V

1. Remove the carburetor air horn and gasket by following instructions under Air Horn to Main Body Gasket Replacement in this section.
2. Hold the air horn assembly bottom side up, and remove the float pin and float and lever assembly. Turn the air horn assembly over and allow the needle pin, spring, needle, and seat to fall into the hand.
3. Remove the needle seat and gasket.
4. Replace the float if the needle pin contact surface is grooved. If the float is serviceable, polish the needle pin contact surface with crocus cloth or steel wool. Replace the float pin if it is worn.
5. Install the needle seat and gasket in the air horn. With the air horn inverted, install the needle, pin spring, needle pin, float and lever assembly, and float pin.
6. Adjust the float level to specifications. Refer to Float Adjustment — Dry, in this Section.
7. Install the carburetor air horn and gasket by following instructions under Air Horn to Main Body Gasket Replacement in this section.

MAIN JET REPLACEMENT — AUTOLITE MODEL 1100 1-V

1. Remove the carburetor air horn and gasket by following the procedure under Air Horn to Main Body Gasket Replacement — Autolite Model 1100 1-V, in this section.
2. Remove and replace the carburetor main jets with a jet wrench or wide bladed screwdriver.
3. Install the carburetor air horn and gasket by following the procedure under Air Horn to Main Body Gasket Replacement — Autolite Model 1100 1-V, in this section.

FLOAT, NEEDLE VALVE AND SEAT, INLET SCREEN, OR MAIN JET REPLACEMENT — AUTOLITE MODELS 2100 2-V AND 4100 4-V

1. Remove the carburetor air horn to main body gasket by following the procedure under Air Horn to Main Body Gasket Replacement — Autolite Models 2100 2-V and 4100 4-V.
2. With the use of a screwdriver, pry the float shaft retainer(s) from the fuel inlet seat(s). Remove the float, float shaft retainer(s) and fuel inlet needle assembly(ies).
3. If required, remove the fuel inlet needle seat(s), filter screen(s) and the main jets with a jet wrench. **Be sure the correct (specified) jets are installed for the primary and secondary (4-V carburetor) systems (Part 10-11).**
4. If required, install the fuel inlet filter(s) in the inlet valve seat bore(s). Install the valve seat(s) and gasket(s). Install the fuel inlet needle valve(s).
5. Slide the float shaft(s) into the float lever(s). Position the float shaft retainer(s) on the float shaft(s).
6. Insert the float assembly(ies) into the fuel bowl(s) and hook the float lever tab(s) under the fuel inlet needle clip(s). Insert the float shaft(s) into the guides at the sides of the fuel bowl(s).
7. With the use of a screwdriver, position the float shaft retainer(s) on the groove of the fuel inlet needle seat(s).
8. Refer to Float Adjustment—Dry, in this section, and perform a dry float fuel level adjustment on the float(s).
9. Install the carburetor air horn and gasket and related parts. Refer to Air Horn to Main Body Gasket Replacement—Autolite Models 2100 2-V and 4100 4-V, in this section, for the proper procedure.
10. Refer to Fuel Level Float Adjustment—Wet, in this section, and perform the wet fuel level adjustment procedures.
11. Adjust the idle fuel mixture and engine idle speed.

MAIN AND AUXILIARY FUEL INLET VALVE REPLACEMENT —AUTOLITE MODEL 4300 4-V

1. Remove the air horn assembly from the main body of the carburetor.

2. Pull the float pivot pin and remove the float and lever assembly.

3. Remove the main fuel inlet needle valve, then use the proper size screwdriver or jet removal tool to remove the main and auxiliary valve seats and gaskets.

4. Install new gaskets on the valve seats. Then install the seats in the air horn.

5. Place the main fuel inlet needle valve in the valve seat.

6. Position the float and lever assembly between the hinge posts and over the fuel inlet valves, then install the float pivot pin. **NOTE: The pin must be inserted from the pump plunger side for self-retention.**

7. Install the air horn on the main body.

8. Adjust the idle fuel mixture and engine idle speed.

ACCELERATING PUMP DIAPHRAGM REPLACEMENT —AUTOLITE MODEL 1100 1-V

1. Remove the air cleaner assembly (Part 10-8, Section 2).
2. Depress the tab on the accelerating pump lever to control rod retaining clip with pliers, and slide the rod out of the lever. Remove the clip from the lever.
3. Remove the accelerator pump cover retaining screws. Lift the cover upward and remove the diaphragm and return spring.
4. Position the new diaphragm on the diaphragm cover, with the diaphragm plunger facing the lever, and line up the holes. While holding the diaphragm in place, position the small diameter of the diaphragm return spring on the boss in the accelerator pump chamber; then, position the cover and the diaphragm over the return spring and onto the lower body. Install the cover retaining screws finger-tight.
5. Push the diaphragm inward with the lever and tighten the cover screws.
6. Position the accelerating pump actuating rod retaining clip over the hole in the accelerating pump lever, with the tab side of the clip toward the carburetor barrel. Depress the tab and insert the end of the rod through the lever and clip. Release the tab when the rod is inserted. Perform the Accelerating Pump Adjustments outlined in this section.
7. Install the air cleaner assembly (Part 10-8, Section 2).

ACCELERATING PUMP DIAPHRAGM AND/OR ELASTOMER VALVE REPLACEMENT—AUTOLITE MODELS 2100 2-V AND 4100 4-V

1. Remove the carburetor air horn to main body gasket following the procedure under Air Horn to Main Body Gasket Replacement—Autolite Models 2100 2-V and 4100 4-V in this section.
2. Remove the accelerating pump operating rod retainer. To release the rod from the retainer, press the tab ends of the clip together; then, at the same time, press the rod away from the clip until it is disengaged. Remove the rod. Remove the accelerating pump cover, diaphragm assembly and spring.
3. If inspection proves it necessary to remove the Elastomer valve, grasp it firmly and pull it out. **If the Elastomer valve tip broke off during removal, be sure to remove**

the tip from the fuel bowl. An Elastomer valve must be replaced whenever it is removed from the main body.

4. If the Elastomer valve was removed, lubricate the tip of a new valve and insert the tip into the accelerator pump cavity. Using needle nosed pliers, reach into the fuel bowl and grasp the valve tip. Pull the valve in until it seats, and cut off the tip forward of the retaining shoulder. Remove the tip from the bowl.

5. Position the new accelerating pump diaphragm assembly to the cover and place the cover and diaphragm assembly in position on the return spring and main body. Install the cover screws finger-tight. Push the accelerating pump plunger the full length of its travel and tighten the cover screws.

6. Position the accelerating pump operating rod in the inboard hole (hole closest to the pump plunger).

7. Adjust the accelerating pump stroke to specification (Part 10-11).

8. Install the carburetor air horn and gasket. Refer to the Air Horn to Main Body Gasket Replacement—Autolite Models 2100 2-V and 4100 4-V, in this section for the proper procedure.

SECONDARY DIAPHRAGM REPLACEMENT—AUTOLITE MODEL 4100 4-V

1. Remove the carburetor air horn to main body gasket by following the procedure under Air Horn to Main Body Gasket Replacement—Autolite Models 2100 2-V and 4100 4-V, in this section.

2. Remove the secondary operating rod retainer and remove the rod. Remove the diaphragm cover, return spring Palnut (if so equipped), and diaphragm.

3. Install the new secondary diaphragm and Palnut (if so equipped) on the secondary operating lever. Install the diaphragm return spring on the cover. Install the cover retaining screws finger-tight. With the diaphragm in the extended position, tighten the cover screws.

4. Install the secondary operating rod in the operating lever, and secure the rod to the secondary throttle shaft with the retaining clip.

5. Check the operation and seal of the secondary vacuum system by opening the primary and secondary throttle plates. Hold the secondary throttle plates open. Place a finger over the secondary vacuum inlet hole in the main body and release the secondary throttle plates. **This is a check for vacuum leakage at the diaphragm.** The throttle plates should not close fully. They will move slightly when released, but they must stop and should not move toward the closed position after the initial movement. Replace the diaphragm or tighten the cover screws as necessary to correct the vacuum leakage.

6. Install the carburetor air horn and gasket following the procedure under Air Horn to Main Body Gasket Replacement—Autolite Models 2100 2-V and 4100 4-V, in this section.

ACCELERATOR PUMP, INLET BALL CHECK, NEEDLE VALVE AND DISCHARGE CHECK VALVE REPLACEMENT AUTOLITE MODEL 4300 4-V

1. Remove the air horn assembly from the main body of the carburetor.

2. Remove the accelerator rod retainer and rod from the accelerator pump lever, then remove the lever from the accelerator pump piston and remove the pump assembly from the air horn.

3. Remove the discharge check valve retainer with a small hook. Invert the air horn and allow the check valve to fall into palm of hand.

4. Remove the accelerator pump inlet ball check retainer with long-nose pliers, then use a magnet to lift the ball check from the pump well.

5. Pick the accelerator pump discharge needle from the discharge cavity.

6. Place the accelerator pump ball check in the pump inlet hole of the pump chamber. Install the ball check retaining ring. **The retaining ring must be installed with the tangs over the pump inlet hole as shown in Fig. 47.**

7. Insert the discharge check valve into the valve cavity, and install the valve retainer flush with the air horn surface. **Note:** The cross slot in the retainer is towards the valve.

8. Place the accelerator pump discharge needle into the pump discharge cavity.

9. Insert the accelerator pump piston in the air horn.

10. Compress the pump plunger and insert accelerator pump arm into plunger stem.

11. Slide fuel vent valve lever on air horn and under pump lever.

Line up holes in both levers and insert pivot pin through the No. 2 hole in levers and the air horn casting (Fig. 37). Install retainer on pin.

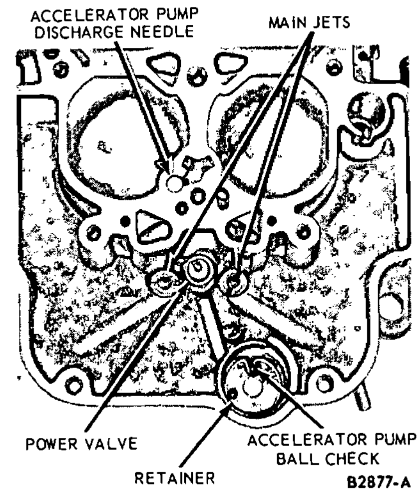


FIG. 47—Main Body Valves and Jets Autolite Model 4300 4-V

12. Install the air horn assembly on the main body.

MAIN METERING JET, LOW-SPEED JET, METERING ROD, ACCELERATING PUMP OR CHECK NEEDLE REPLACEMENT—CARTER MODEL YF 1-V

Removal

1. Remove the carburetor from the engine as described in Part 10-3.

2. Remove the carburetor air horn and gasket by following the instructions under Air Horn to Main Body Gasket Replacement in this section.

3. Turn the main body casting upside down and catch the accelerating pump check needle in your hand.

4. Loosen the throttle shaft arm screw, and remove the arm and the pump connector link.

5. Remove the accelerating pump diaphragm housing screws. Lift out the pump diaphragm assembly, the pump lifter link, the metering rod and the fuel bowl baffle plate as a unit (Fig. 48).

6. Disengage the metering rod arm spring from the metering rod, and remove the metering rod from the metering rod arm assembly. Compress the upper pump spring, and remove the spring retainer. Remove the upper spring, the metering rod arm assembly, and the pump lifter link from the pump diaphragm shaft. Compress the pump diaphragm spring, and remove the pump diaphragm spring retainer, spring, and pump diaphragm assembly from the pump diaphragm housing assembly.

7. **With the proper size jet tool**

or screwdriver remove the low speed jet and the metering rod jet (Fig. 49).

Installation

1. With the proper size jet tool (or screwdriver) install the low speed jet and the metering rod jet (Fig. 49).

2. Install the pump diaphragm in the pump diaphragm housing. Position the pump diaphragm spring on the diaphragm shaft and housing assembly. Install the spring retainer. Install the pump lifter link, metering rod arm and spring assembly, and upper pump spring on the diaphragm shaft. Depress the spring and install the upper pump spring retainer.

3. Install the metering rod on the metering rod arm and place the looped end of the metering rod arm spring on the metering rod as shown in Fig. 48. Align the pump diaphragm with the diaphragm housing; make sure holes are aligned. Install the housing attaching screws to keep the diaphragm and housing aligned.

4. Install the carburetor air horn and gasket as described under Air Horn to Main Body Gasket Replacement in this section.

5. Install the carburetor on the engine as described in Part 10-3.

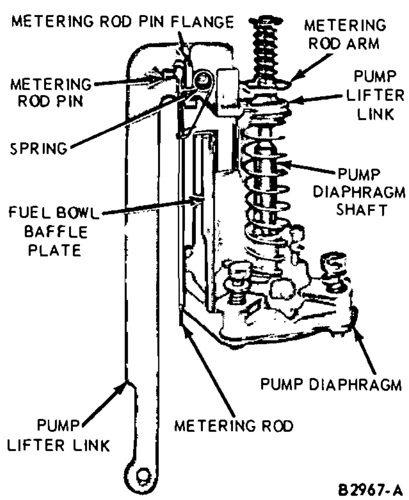


FIG. 48—Accelerating Pump and Lifter Link Assembly—Carter Model YF 1-V

ANTI-STALL DASHPOT REPLACEMENT

Diaphragm Replacement—Autolite Model 1100 1-V

1. Remove the air cleaner assembly (Part 10-8, Section 2).

2. Depress the tab on the dashpot lever to control rod retaining clip with pliers and slide the rod out of the lever. Remove the clip from the lever.

3. Remove the dashpot cover retaining screws. Remove the cover, diaphragm and return spring.

4. Position the new diaphragm on the dashpot cover, with the diaphragm plunger facing the lever, and line up the holes. Position the small diameter of the spring on the boss in the dash pot chamber; then, position the cover and diaphragm over the return spring and onto the lower body. Install the cover retaining screws finger-tight.

5. Push the diaphragm inward with the lever and tighten the cover screws.

6. Position the dashpot actuating rod retaining clip over the hole in the accelerating pump lever, with the tab side of the clip toward the carburetor barrel. Depress the tab and insert the end of the rod through the lever and clip. Release the tab when the rod is inserted. Adjust the dashpot. Refer to Anti-Stall Dashpot Automatic Transmission, in this section, for the proper adjustment procedure.

7. Install the air cleaner assembly (Part 10-8, Section 2).

Autolite Models 1100 1-V, 2100 2-V, 4100 4-V, 4300 4-V and Carter YF Type 1-V

1. Remove the air cleaner assembly (Part 10-8, Section 2).

2. Remove the retaining nut and the dashpot from the mounting bracket.

3. Install the new dashpot and retaining nut on the mounting bracket.

4. Adjust the anti-stall dashpot. Refer to Anti-Stall Dashpot-Automatic Transmissions, in this section for the proper procedure.

5. Install the air cleaner (Part 10-8, Section 2).

THERMOSTATIC CHOKE SPRING HOUSING AND GASKET REPLACEMENT

1. Remove the carburetor air cleaner assembly (Part 10-8, Section 2).

2. Remove the heater hose and mounting bracket from the carburetor, except on the Autolite Model 4300 4-V. On the Autolite Model 4300 carburetor, disconnect the choke heat tube.

3. Remove the thermostatic spring housing clamp retaining screws and remove the spring housing and gasket. Discard the gasket.

4. Replace the spring housing, if required.

5. Position the thermostatic choke spring housing gasket on the choke housing. On the **Autolite Model 1100 1-V carburetor,** make sure the loop at the end of the thermostatic spring is on the thermostatic spring lever. On **Autolite Model 2100 2-V or 4100 4-V carburetors,** make sure the slot in the arm of the thermostatic spring lever is inserted into the loop of the thermostatic spring. On the **Carter YF Type 1-V** carburetor, be sure the thermostatic spring housing gasket is in-

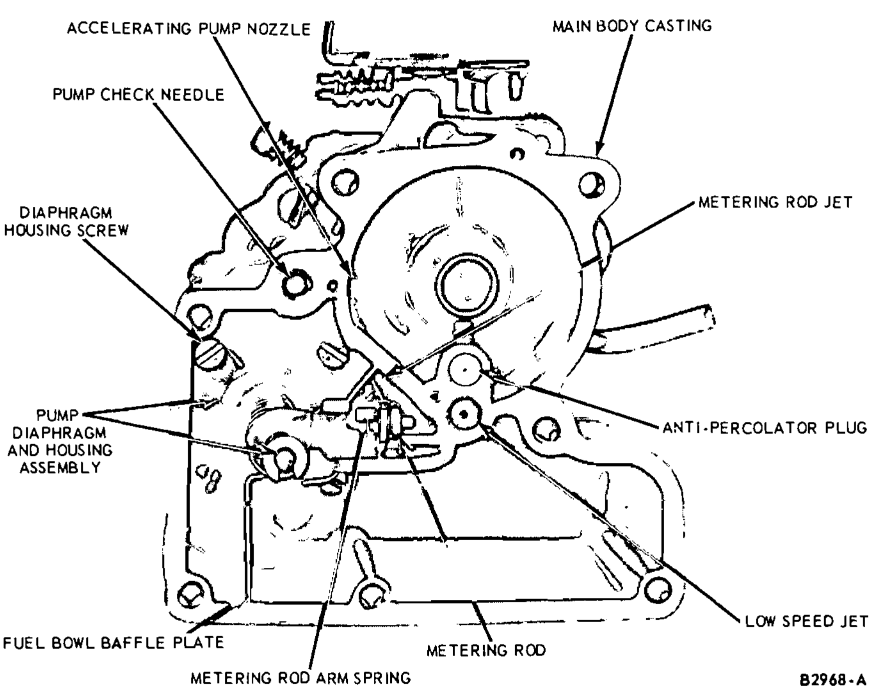


FIG. 49—Pump Diaphragm and Housing Installation—Carter Model YF 1-V

stalled between the spring housing and baffle plate and the thermostatic spring engaged with the tang on the choke plate lever. Position the retainers over the thermostatic spring housing and loosely install the retaining screws.

6. Set the thermostatic spring housing to the specified index mark (Part 10-11) and tighten the retaining screws.

7. Install the heater hose mounting bracket, heater hose, choke heat tube (if applicable), and the air cleaner assembly (Part 10-8, Section 2) on the carburetor.

THERMOSTATIC CHOKE ASSEMBLY REMOVAL AND INSTALLATION—CLEAN AND OVERHAUL

Autolite Model 1100 1-V

1. Remove the carburetor assembly from the vehicle. Refer to Removal and Installation (Part 10-2, Section 2) for the procedures.

2. Remove the choke pull-down rod to throttle lever retainer (Fig. 12 in Part 10-2, Section 3). Remove the rod from the lever.

3. Remove the choke thermostatic spring housing to choke housing retaining screws. Remove the thermostat spring housing clamp, housing and the gasket. Discard the gasket.

4. Remove the choke housing to lower body retaining screws. Rotate the choke housing to disconnect the choke control rod and remove the choke housing and the gasket. Discard the gasket.

5. Remove the choke control lever to thermostatic choke shaft screw. Remove the choke control lever assembly and the spring. Slide the choke shaft out of the choke housing.

6. Remove the choke control rod from the lever.

7. Remove the choke pulldown rod adjusting nut from the rod. Slide the rod out of the swivel.

8. Clean and inspect the automatic choke. Refer to Cleaning and Inspection (Part 10-1, Section 3) for the procedures. Replace all worn or damaged parts.

9. When facing the cam side of the choke housing (Part 10-2, Section 3), position the choke shaft spring over the bushing hub with the hook of the spring on the cam finger (spring windup will rotate the cam counterclockwise).

10. Hold the cam finger clockwise and against the stop of the housing; then rotate the spring counterclockwise until the spring straight end passes the cam finger. Position the choke control lever over the fast idle cam, with the pulldown swivel away from the housing and the short tang between the cam finger and the spring straight end.

11. Insert the thermostatic choke shaft assembly into the choke housing from the bimetal spring side of the housing and into the choke control lever (the pull-down swivel and the thermostatic spring arm should be aligned and not opposite), and install the retaining screw.

12. Insert the threaded end of the choke pull-down rod through the swivel (from the bottom) and install the adjusting nut.

13. Position the short end of the choke control rod into the keyhole in the choke housing choke lever.

14. Insert the choke assembly retaining screws into the choke housing. Position the new choke control gasket and the choke housing onto the lower body, connecting the rod to the choke plate shaft. Start the retaining screws into the body.

15. Insert the end of the choke pull-down rod into the throttle shaft lever hole and install the retainer.

16. Check the position of the choke control gasket and tighten the retaining screws.

17. Position the thermostatic spring housing, new gasket and cover to the choke housing, making sure the loop at the end of the thermostatic spring is on the choke lever. Loosely install the thermostatic spring housing clamp and the retaining screws. Rotate the spring housing in a counterclockwise (rich) direction and align the index mark on the spring housing with the specified index mark (Part 10-11) on the choke housing. Tighten the retaining screws.

18. Perform the Automatic Choke Plate Clearance (Pull-Down) and Fast Idle Cam Linkage Adjustment —Autolite Model 1100 1-V, outlined in this section of the manual.

19. Install the carburetor assembly. Refer to Removal and Installation (Part 10-2, Section 2) for the procedures.

Autolite Model 2100 2-V and 4100 4-V

1. Remove the carburetor air cleaner assembly (Part 10-8, Section 2).

2. Remove the heater hose and mounting bracket from the carburetor. Disconnect the choke heat tube from the carburetor.

3. Remove the fast idle cam retainer.

4. Remove the choke control rod retainer. Remove the choke housing retaining screws. Remove the choke housing assembly, gasket and fast idle cam as a unit. Remove the fast idle cam and rod from the fast idle cam lever.

5. If it is necessary to clean and overhaul the thermostatic choke housing assembly, remove the choke lever retaining screw and washer. Remove the choke piston lever from the housing. If necessary, remove the pin securing the choke piston to the choke lever link. Remove the choke lever and fast idle cam lever from the choke housing.

6. Clean and inspect the component parts. Refer to Cleaning and Inspection (Part 10-1, Section 3) for the proper procedure.

7. If it was necessary to clean and overhaul the thermostatic choke assembly, perform the following procedure:

If the choke piston and link was disassembled, install the choke piston on the choke thermostatic spring lever link and install the retaining pin.

Position the fast idle cam lever on the thermostatic choke shaft and lever assembly. **The bottom of the fast idle lever adjusting screw must rest against the tang on the choke shaft lever.** Insert the choke shaft assembly into the rear of the choke housing. Position the choke shaft lever so that the hole in the lever is to the left side of the choke housing.

Insert the choke piston into the choke housing. Position the choke thermostatic spring lever on the flange of the choke shaft, and install the retaining screw and washer.

8. Install the fast idle cam rod on the fast idle cam lever. Place the fast idle cam on the fast idle cam rod and install the retainer. Place the choke housing vacuum pick-up port to main body gasket on the choke housing flange.

9. Position the choke housing on the main body, and at the same time, install the fast idle cam on the hub of the main body. Position the gasket and install the choke housing retaining screws. Install the fast idle cam retainer.

10. Connect the choke heat inlet tube to the carburetor thermostatic choke housing.

11. Refer to the Automatic Choke Plate Clearance (Pull-Down) and Fast Idle Cam Linkage adjustment procedures, in this section, and perform steps 2 through 9.

VENT VALVE REPLACEMENT —AUTOLITE MODEL 1100 1-V

1. Remove the air cleaner assembly (Part 10-8, Section 2).
2. Remove the stake marks and the vent rod opening with a scraper or a small file.
3. Remove the roll pin securing the vent rod actuating lever to the accelerator pump cover. **Use pliers to rotate the pin in a direction that will coil the pin to a small diameter. If the pin offers resistance to turning, turn it in the opposite direction.** Remove the lever from the rod.
4. Remove the vent rod assembly by pulling it outward. Remove the return spring.
5. Insert the fuel vent valve return spring in the vent passage. Insert the piston end of the fuel vent rod in the passage.
6. Punch 3 indentations in the vent valve passage opening with a center punch and a hammer. The indentations must distort the inside edge of the opening sufficiently to act as a stop for the piston end of the vent rod.
7. Install the vent rod actuating lever on the vent rod. Position the lever on the accelerator pump cover and install the roll pin with pliers.
8. Perform a Vent Valve Adjustment as outlined in this section of the manual.
9. Install the air cleaner assembly (Part 10-8, Section 2).

SPARK VALVE OR GASKET REPLACEMENT—AUTOLITE MODEL 1100 1-V

1. Remove the spark valve with a wrench. Remove and discard the gasket.
2. Install a new gasket on the spark valve. Install the spark valve and tighten it securely with a wrench.

POWER VALVE OR GASKETS REPLACEMENT—AUTOLITE MODEL 4100 4-V

1. Remove the carburetor from the vehicle. Refer to Part 10-5, Section 2 for the proper procedure.
2. Test the power valve (Part 10-1, Section 1).
3. If it is necessary to replace the cover gaskets or power valve, invert the main body. Remove the power valve cover and gasket. Discard the gasket. Remove the power valve with a box wrench or socket wrench. Discard the power valve gasket.

Install a new gasket on the power valve. Install the power valve and gasket. **Tighten the power valve securely.** Position a new cover gasket on the main body. Install the cover and tighten the retaining screws securely.

4. Install the carburetor assembly on the vehicle. Refer to Part 10-5, Section 2 for the proper procedure.

POWER VALVE REPLACEMENT AUTOLITE MODEL 4300 4-V

1. Remove the air horn assembly from the main body of the carburetor.

2. With a 3/8 deep socket, remove the power valve from the floor of the main body fuel bowl.

3. Install the new power valve in the main body.

4. **Do not remove the power valve vacuum piston assembly from the air horn.** It is staked in place in the air horn, and care must be used to avoid damage to the air horn casting when relieving the staked areas. Usually it is replaced only during carburetor rebuilding operations.

5. Install the air horn on the main body.

CARBURETOR SPACER AND GASKETS REPLACEMENT

It is necessary to remove the carburetor from the vehicle to replace a carburetor spacer and gaskets. Refer to the Carburetor Removal and Installation procedure steps in this group that pertain to the type of carburetor installed on the vehicle.

THROTTLE LINKAGE REPAIR —MANUAL SHIFT TRANSMISSIONS

Accelerator Pedal Cover Replacement

Refer to Figs. 41 through 43 and Figs. 45 and 46 for views of the accelerator pedal cover for the applicable vehicle models.

1. Hold the accelerator pedal in a manner that will prevent strain on the accelerator linkage and uncrimp the pedal cover to pedal retaining tabs. Remove the pedal cover.

2. Position the new pad on the accelerator pedal and carefully crimp the retaining tabs in a manner that will prevent distortion of the tabs and movement of the cover on the accelerator pedal pad.

Accelerator Pedal Pad Replacement

Refer to Figs. 41 through 46 for views of the accelerator pedal pad for the applicable vehicle models.

1. Pry the edges of the accelerator pedal pad from the accelerator pedal with the fingers and remove the pad from the pedal.
2. Position the new accelerator pad on the accelerator pedal. Fold the pedal pad edges over the pedal with the fingers. **Make sure the pedal pad is properly seated on the pedal and that the pedal spring has not been dislodged.**

Accelerator Pedal Replacement

Refer to Figs. 41 through 46 for views of the accelerator pedal for the applicable vehicle model(s).

1. Remove the retaining screw and nut securing the accelerator pedal assembly to the accelerator shaft. Remove the accelerator pedal and spring. Remove the accelerator pedal pad or cover (if so equipped) and discard it if it needs to be replaced.
2. Install the accelerator pedal pad or cover (if so equipped) on the accelerator pedal. Insert the pedal spring into position in the slot on the lower surface of the pedal.
3. Lubricate the accelerator pedal hinge points with the specified lubricant (Group 21) and position the accelerator pedal and spring assembly on the accelerator shaft and install the retaining screw. **Make sure the spring is properly seated on the pedal and the accelerator shaft. Install the retaining nut.**

Accelerator Shaft Replacement

Refer to Figs. 41 through 46 for views of the accelerator linkage components for the applicable vehicle model(s).

1. Remove the accelerator pedal assembly. Refer to Accelerator Pedal Replacement, in this section, for the proper procedures.

2. Disconnect the accelerator retracting spring.

3. On all models except the Mustang, Falcon, Mercury Intermediate and Fairlane Six engines, remove the accelerator shaft to bellcrank rod retaining cotter pin, washer, rubber grommet, bushing and clevis from the accelerator shaft assembly.

On Falcon, Fairlane and Mercury Intermediate Six engines, loosen the accelerator shaft to bellcrank rod retaining clip. Disconnect the accelerator shaft to bellcrank rod from the

accelerator shaft assembly. Remove the retaining clip.

On a Mustang Six engine, disconnect the accelerator control shaft rod from the accelerator shaft assembly.

4. On a Fairlane, Falcon and Mercury Intermediate Six engine, disconnect the stabilizer rod from the accelerator shaft assembly inner bracket.

5. Remove the retaining screws securing the accelerator shaft assembly bracket(s) to the dashpanel within the engine compartment. Remove the accelerator shaft assembly, seal and insulator as a unit. Discard the seal and the insulator if they are worn or damaged.

6. Lubricate the accelerator shaft hinge points with the specified lubricant (Group 21). Install the seal and insulator on the accelerator shaft assembly. Position the accelerator shaft bracket(s) seal and insulator on the dashpanel. **Make sure the seal is properly installed to prevent the entrance of air, dirt and foreign material.** Secure the accelerator shaft assembly bracket(s) to the dashpanel with the retaining screws.

On a Fairlane, Falcon and Mercury Intermediate Six engine, connect the stabilizer rod to the accelerator shaft assembly inner bracket.

7. On a Mustang Six engine, connect the accelerator control shaft rod to the accelerator shaft. **Make sure the rods are properly connected.**

On a Falcon, Fairlane and Mercury Intermediate Six engine, install the retaining clip on the accelerator shaft. Connect the accelerator bellcrank clevis to the accelerator shaft, and secure the retaining clip to bellcrank rod.

On all models except the Mustang, Falcon, Fairlane and Mercury Intermediate Six engines, install the bushing and rubber grommet on the accelerator shaft to bellcrank rod clevis, and install the clevis on the accelerator shaft assembly. Install the washer and cotter pin on the clevis. Spread the ends of the retaining cotter pin.

8. Install the accelerator shaft retracting spring.

9. Install the accelerator pedal assembly. Refer to Accelerator Pedal Replacement in this section for the proper procedure.

10. Check the accelerator pedal for the specified idle height from the dash panel. Refer to Throttle Linkage Adjustment in this section for the proper procedure. Adjust the throttle linkage, if required.

Accelerator Control Shaft Rod or Accelerator Bellcrank to Carburetor Rod Replacement

Refer to Figs. 41 through 42 for views of the accelerator linkage components for the applicable car model(s).

1. Remove the accelerator retracting spring and return spring (if so equipped).

2. Disconnect and remove the accelerator control shaft rod (Mustang Six) or accelerator bellcrank to carburetor rod.

3. Lubricate the accelerator control shaft rod or accelerator bellcrank to carburetor rod hinge point(s) with the specified lubricant (Group 21).

4. Install the accelerator control shaft rod (Mustang Six) or bellcrank to carburetor rod. **If the accelerator control shaft or bellcrank to carburetor rod is equipped with ball retaining clips, make sure the clips are properly seated over the ball.**

5. Install the accelerator retracting spring and return spring (if so equipped).

6. On a Mustang Six engine, check the accelerator pedal for the specified idle height from the dash panel. Refer to Throttle Linkage Adjustment in this section for the proper procedure. Adjust the throttle linkage if required.

Accelerator Shaft To Bellcrank Rod Replacement

Refer to Figs. 42 through 46 for views of the accelerator linkage components for the applicable car model(s).

1. Disconnect the accelerator retracting spring.

2. On all models except the Mustang, Falcon, Mercury Intermediate and Fairlane Six engines, remove the accelerator shaft to bellcrank rod retaining cotter pin, washer, rubber grommet, bushing and clevis from the accelerator shaft assembly. Disconnect the accelerator shaft to bellcrank rod at the carburetor throttle lever or bellcrank (if so equipped) lever.

On Falcon, Fairlane and Mercury Intermediate Six engines, loosen the accelerator shaft to bellcrank rod retaining clip. Disconnect the accelerator shaft to bellcrank rod from the accelerator shaft assembly. Remove the retaining clip. Disconnect the accelerator shaft to bellcrank rod at the bellcrank lever.

3. Replace all worn or damaged parts. Lubricate the accelerator shaft to bellcrank rod hinge points with the specified lubricant (Group 21).

4. On a Fairlane or Mercury Intermediate 289 or 390 V-8 engine, check the bellcrank stabilizer for proper adjustment. Refer to Bellcrank Stabilizer Adjustment—289 and 390 V-8 in this section, for the proper procedure.

5. On a Falcon, Fairlane and Mercury Intermediate Six engine, install the retaining clip on the accelerator shaft. Connect the accelerator bellcrank clevis to the accelerator shaft, and secure the retaining clip to bellcrank rod.

On all models except the Mustang, Falcon, Fairlane and Mercury Intermediate Six engines, install the bushing and rubber grommet on the accelerator shaft to bellcrank rod clevis, and install the clevis on the accelerator shaft assembly. Install the washer and cotter pin on the clevis. Spread the ends of the retaining cotter pin.

6. Adjust the throttle (accelerator) linkage to obtain the specified accelerator pedal idle height, and connect the accelerator shaft to bellcrank rod to the carburetor throttle lever or bellcrank lever (if so equipped). Refer to Throttle Linkage Adjustments, in this section, for the proper procedure.

Bellcrank Stabilizer Replacement

Refer to Figs. 45 and 46 for views of the accelerator linkage components for the applicable car model(s).

1. Loosen the bellcrank stabilizer rod retaining clips and disconnect the stabilizer rod from the retaining brackets.

2. Replace all worn or damaged parts.

3. Install the retaining clips on the bellcrank stabilizer brackets and connect the stabilizer rod to the brackets.

4. On a Fairlane or Mercury Intermediate 289 or 390 V-8 engine, perform a bellcrank stabilizer adjustment. Refer to Bellcrank Stabilizer Adjustment—Fairlane and Mercury Intermediate 289 or 390 V-8, in this section, for the proper procedure.

Accelerator Bellcrank Replacement Assembly

Refer to Figs. 42, 45 and 46 for views of the accelerator linkage components for the applicable car model(s).

1. Disconnect the accelerator shaft retracting spring.

2. On a Falcon, Mercury Intermediate and Fairlane Six engine, disconnect the accelerator shaft to bellcrank rod at the bellcrank. Disconnect the bellcrank stabilizer rod from the bellcrank stabilizer bracket. Disconnect the accelerator shaft to bellcrank rod

at the accelerator shaft. Remove the bellcrank stabilizer bracket retaining washer. Remove the bellcrank assembly.

3. On a Fairlane and Mercury Intermediate V-8 engine, disconnect the bellcrank stabilizer rod, accelerator shaft to bellcrank rod and the accelerator bellcrank to carburetor rod from the bellcrank assembly. Remove the bellcrank retaining screws and remove the bellcrank assembly.

4. Replace all worn or damaged parts. Lubricate the accelerator linkage hinge points with the specified lubricant (Group 21).

5. On a Falcon, Mercury Intermediate, Fairlane Six engine, install the bellcrank stabilizer bracket assembly and retaining washer. Connect the accelerator shaft to bellcrank rod at the accelerator shaft. Connect the bellcrank stabilizer rod to the bellcrank stabilizer bracket. Connect the accelerator shaft to bellcrank rod at the bellcrank. **Make sure the accelerator linkage retaining clips are securely fastened.**

6. On a Fairlane and Mercury Intermediate V-8 engine, install the bellcrank assembly on the engine; position the anti-backfire bracket and brace (if so equipped) on the bellcrank and install the retaining screws. Torque the screws to specification. Connect the bellcrank to carburetor rod to the bellcrank.

Perform a bellcrank stabilizer adjustment and connect the stabilizer rod to the bellcrank. Refer to Bellcrank Stabilizer Adjustment—Fairlane and Mercury Intermediate 289 V-8, in this section, for the proper procedure.

Connect the accelerator shaft to bellcrank rod to the bellcrank.

Make sure the accelerator linkage retaining clips are securely fastened.

7. Check the accelerator pedal idle height and adjust the linkage, if required. Refer to Throttle Linkage Adjustment in this section for the proper procedure.

8. Connect the accelerator retracting spring.

THROTTLE LINKAGE REPAIR—AUTOMATIC TRANSMISSION

The throttle linkage repair procedures for automatic transmissions are covered in Group 7.

3 CLEANING AND INSPECTION

CARBURETOR

Dirt, gum, water or carbon contamination in the carburetor or the exterior moving parts of the carburetor are often responsible for unsatisfactory performance. For this reason, efficient carburetion depends upon careful cleaning and inspection.

The cleaning and inspection of only those parts not included in the carburetor overhaul repair kit are covered here. All gaskets and parts included in the repair kit should be installed when the carburetor is assembled and the old gaskets and parts should be discarded.

Wash all the carburetor parts (except the accelerating pump diaphragm, the power valve, the secondary operating diaphragm, and the anti-stall dashpot assembly) in clean commercial carburetor cleaning solvent. If a commercial solvent is not available, lacquer thinner or denatured alcohol may be used.

Rinse the parts in kerosene to remove all traces of the cleaning solvent, then dry them with compressed air. Wipe all parts that can not be immersed in solvent with a clean, soft, dry cloth. Be sure all dirt, gum, carbon, and other foreign matter are removed from all parts.

Force compressed air through all passages of the carburetor. **Do not use a wire brush to clean any parts or a drill or wire to clean out any openings or passages in the carburetor.** A drill or wire may enlarge the hole or passage, changing the calibration of the carburetor.

Check the choke shaft for grooves, wear and excessive looseness or binding. Inspect the choke plate for nicked edges and for ease of operation and free it if necessary. Make sure all carbon and foreign material has been removed from the automatic choke housing and the piston. Check the operation of the choke piston in the choke housing to make certain it has free movement.

Check the throttle shafts in their bores for excessive looseness or binding and check the throttle plates for burrs which prevent proper closure.

Inspect the main body, throttle body, metering body and secondary metering block (Holley 4-V carburetor, air horn, nozzle bars and booster venturi assemblies (2-V and 4-V carburetors), choke housing and thermostatic spring housing, power valve cover, accelerating pump cover, secondary operating diaphragm cover (Autolite Model 4100 4-V) and the diaphragm housing (Holley 4-V carburetors) for cracks.

Check metallic float(s) for leaks by holding them under water that has been heated to just below the boiling point. Bubbles will appear if there is a leak. If a float leaks, replace it.

Replace the float if the arm needle contact surface is grooved. If the floats are serviceable, polish the needle contact surface of the arm with crocus cloth or steel wool. Replace the float shafts if they are worn.

Replace all screws and nuts that have stripped threads. Replace all distorted or broken springs.

Inspect all gasket mating surfaces for nicks and burrs. Repair or replace any parts that have a damaged gasket surface.

On Autolite Models 2100 2-V and 4100 4-V carburetors, inspect the idle tubes in each nozzle bar assembly. If they are plugged, bent or broken, replace the booster venturi and nozzle bar assembly.

On Holley 4-V carburetors, inspect the main and accelerating pump discharge nozzles and idle restrictions. If any of the openings are blocked, open them with compressed air.

Inspect the rubber boot of the anti-stall dashpot for proper installation in the groove of the stem bushing. Check the stem movement for smooth operation. Do not lubricate the stem. Replace the assembly if it is defective.

FUEL PUMP

On all Carter permanently sealed fuel pumps, clean the fuel pump with a cloth. Inspect the fuel pump for cracks or damage. Inspect the mounting flange for distortion. Inspect the rocker arm spring, pin and the rocker arm for wear, cracks or damage. **The rocker arm spring, pin and the rocker arm are the only components on the permanently sealed fuel pumps that are replaceable.** If any other fuel pump components are damaged beyond repair, replace the fuel pump.

(Continued on Page 10-30)

FLOODING OR LEAKING CARBURETOR	Cracked carburetor body, or fuel bowl (Holley 4-V). Defective main body and/or fuel bowl gasket(s) (Holley 4-V). High fuel level or float setting. Fuel inlet needle not seating properly or worn needle and/or seat. Ruptured accelerating pump diaphragm. Excessive fuel pump pressure. Defective power valve gasket. Ruptured power valve diaphragm. Loose fuel inlet needle valve seat or seat gasket damaged or missing. Sticking and/or restricted float operation. Float tab surface rough. Dirt or foreign material in fuel holds float needle valve open.
HARD STARTING	Choke linkage or plate binding. Incorrect setting of choke thermostatic spring housing. Improper starting procedure, causing a flooded engine. Improper carburetor fuel level. Improper idle adjustments. Sticking or incorrectly seating fuel inlet needle. Incorrect fuel pump pressure. Improper carburetor gasket and/or spacer combination. Binding or broken manual choke linkage. Restrictions or air leaks in the choke vacuum or hot air passages. Dirty air cleaner element. Backfire suppressor valve stuck open (if equipped with Thermactor exhaust emission control).
STALLING	**ENGINE HOT OR COLD** Incorrect idle fuel mixture. Engine idle speed too slow (fast or cold idle adjustments). Dirt, water or ice in fuel filter. Positive crankcase ventilation system malfunctioning or restricted. Fuel lines restricted or leaking air. Fuel tank vent restricted. Leaking intake manifold or carburetor gaskets. Carburetor icing (cold, wet or humid weather). Incorrect throttle linkage adjustment to carburetor. Clogged air bleeds or idle passages. Defective fuel pump. **ENGINE HOT ONLY** Improperly adjusted or defective carburetor dashpot (Ford carburetors). Idle compensator malfunctioning (Autolite 4-V). Coolant control thermostat defective. Excessive looseness of throttle shaft in bore(s) of throttle body.
ROUGH IDLE	Improperly adjusted idle mixture screw. Idle air screw improperly adjusted (Autolite 4300 4-V). Throttle plates and/or throttle shaft bent or damaged. Throttle plates misaligned. Backfire suppressor valve stuck open (if equipped with Thermactor exhaust emission control). Positive crankcase ventilation system malfunctioning or restricted. Idle compensator malfunction (Autolite 4-V). Idle adjusting needle(s) grooved, worn, or otherwise damaged. Caps missing from unused vacuum take-off sources. Idle air bleeds restricted. Idle air or fuel passages restricted. Idle discharge holes restricted. Idle discharge holes not in proper relation to throttle plate(s). Excessive dirt in air cleaner. High or low fuel level or float setting.

FIG. 50—Carburetor Diagnosis Guide

ROUGH IDLE (Continued)	Fuel inlet needle not seating properly, or worn needle or seat. Power valve leaking. Restricted air bleeds. Plugged idle fuel channel restrictor. Worn or damaged main metering jet. Accelerating pump discharge ball	check or needle (Holley 4-V) and/or weight not seating properly. Fuel pump pressure too low, or excessive. Fuel siphoning from secondary main fuel system (Holley 4-V or Ford 4-V). Restriction in main fuel passage.
POOR ACCELERATION	Poor acceleration complaints fall under one of three headings: the engine is sluggish on acceleration, the engine stalls when accelerated, or the engine hesitates or develops a flat spot when accelerated. Poor acceleration is caused by either an excessively lean or rich mixture on acceleration and/or defects or improper adjustments in the ignition system. **A LEAN MIXTURE ON ACCELERATION CAN BE CAUSED BY:** Accelerating pump diaphragm defective. Incorrect accelerating pump stroke adjustment. Low fuel pump pressure. Sticking fuel inlet needle. Low fuel level or float setting. Restriction in main fuel passage. Air leak between the carburetor and the manifold caused by loose mounting bolts or defective gasket. Air leak at the throttle shaft caused by a worn throttle shaft. Accelerating pump fuel inlet valve (Elastomer valve or ball check) not seating on acceleration. Restriction in the accelerating pump discharge passage. Accelerating pump discharge Elastomer valve (Ford 2-V or 4-V), ball check or weight not coming fully off its seat, or failing to seat properly on the reverse stroke of the pump diaphragm. Air leak at the accelerating pump cover caused by a defective gasket or warped pump cover. **4-V CARBURETORS** Defective power valve spring. Defective secondary diaphragm. Air leak where secondary vacuum	pick-up tube fits into air horn, between air horn and the main body, or between the secondary diaphragm housing cover and housing. Secondary throttle plates wedged in barrels. Bent secondary throttle shaft. Secondary throttle plates operating rod binding, or disconnected from secondary diaphragm or secondary throttle lever. Secondary vacuum passage ball check stuck on its seat. Secondary vacuum probe restricted or not properly positioned. Secondary throttle air plates torsion spring improperly adjusted (Autolite 4300). Restricted secondary fuel passages. Power valve stuck. Defective power vacuum piston valve spring (Autolite 4300). **A RICH MIXTURE ON ACCELERATION CAN BE CAUSED BY:** Broken power valve spring. Stuck or improperly adjusted secondary throttle air plates. Secondary throttle damper piston or linkage stuck. High fuel level or float setting. Fuel inlet needle not seating properly or worn needle and/or seat. Malfunctioning automatic choke. Excessively dirty air cleaner. Incorrect accelerating pump stroke adjustment. Power valve leakage. Restricted air bleeds. Worn or damaged main metering jet. Accelerating pump Elastomer valve (Ford 2-V or 4-V) ball check and/or weight not seating properly. Excessive fuel pump pressure.
INCONSISTENT ENGINE IDLE SPEED	Anti-backfire valve stuck open (if equipped with Thermactor exhaust emission control). Fast idle screw contacting low step of cam at curb idle. Incorrect throttle linkage adjustment to carburetor. Binding or sticking throttle linkage or accelerator pedal. Sticking carburetor throttle shaft. Excessive looseness of throttle shaft in bores of throttle body.	Improperly adjusted or defective carburetor dashpot (automatic transmission). Incorrectly installed throttle plates. Idle compensator malfunctioning (Ford 4-V). Positive crankcase ventilation system restricted. Sticking fuel inlet needle. Defective spark valve or gasket (Ford 1-V). Defective power valve or gasket.

FIG. 50—Carburetor Diagnosis Guide (Continued)

AUTOMATIC CHOKE SLOW WARM-UP, ON TOO OFTEN	Thermostatic choke setting too rich. Choke linkage sticking or binding. Incorrect choke linkage adjustment. Choke plate misaligned or binding in air horn.	Defective coolant thermostat. Restricted coolant line at carburetor. Restriction or air leak in the choke vacuum or hot air passage. Choke heat inlet tube restricted. Choke clean air tube restricted.
SEVERE TRANSMISSION ENGAGEMENT AFTER COLD ENGINE START	Carburetor fast idle speed setting too high. Throttle operating on starting step (highest step) of fast idle cam.	Binding or sticking throttle linkage. Dashpot setting incorrect.
SURGING (CRUISING SPEEDS TO TOP SPEEDS)	Clogged main jets. Improper size main jets. Low fuel level or float setting. Clogged filter or filter screen. Distributor vacuum passage clogged.	Defective spark valve or gasket (Ford 1-V). Defective power valve or gasket. Distributor advance incorrect. Low fuel pump pressure or volume.
REDUCED TOP SPEED	Excessive dirt in air cleaner. Float setting too high or too low. Fuel pump pressure or volume too high or too low. Improper size or obstructed main jets. Power valve spring weak, or power valve restricted. Restricted air bleeds. Restriction in main fuel passages. Throttle plates not fully open. Faulty choke operation. Improper throttle linkage adjustment. **4-V CARBURETORS** Air leak where secondary vacuum pick-up tube fits into air horn and	main body, or air leakage between the secondary diaphragm housing cover and housing or the air horn mounting gasket. Secondary diaphragm return spring too stiff. Secondary throttle plates wedged in barrels. Bent secondary throttle shaft. Secondary throttle plate operating rod binding. Secondary vacuum passage ball check sticking on its seat. Secondary damper linkage sticking. Distributor advance incorrect. Backfire suppressor valve stuck open (if equipped with Thermactor exhaust emission control).

FIG. 50—Carburetor Diagnosis Guide (Continued)

AIR CLEANER—DRY TYPE

MAINTENANCE

Refer to Group 19 for the recommended air cleaner assembly maintenance mileage interval.

REMOVAL AND INSTALLATION

Refer to Part 10-8, Section 2 for the air cleaner assembly removal and installation procedures.

FILTER ELEMENT

There are two procedures that can be used to clean the air filter element. One method is performed with the use of compressed air. The other is performed by tapping the element on a smooth horizontal surface.

Compressed Air Method

Direct a stream of compressed air through the element in the direction opposite that of the intake air flow, that is from the inside outward. **Extreme care must be exercised to prevent rupture of the element material.**

Tapping Method

Hold the element in the vertical position and tap it lightly against a smooth, horizontal surface to shake the dust and dirt out. **Do not deform the element or damage the gasket surfaces by tapping too hard.** Rotate the filter after each tap until the entire outer surface has been cleaned.

Inspection

Hold the filter in front of a back-up light and carefully inspect it for any splits or cracks. If the filter is split or cracked, replace it.

BODY AND COVER

Clean the air cleaner body and the cover with a solvent or compressed air. If the air cleaner contains an opening for the crankcase ventilation system air flow, probe the opening to assure removal of deposits. Wipe the air cleaner dry if a solvent is used. Inspect the air cleaner body and cover for distortion or damage at the gasket mating surfaces. Replace the cover or body if they are damaged beyond repair.

LOW FUEL PUMP PRESSURE OR VOLUME	Diaphragm stretched or leaking. Fuel pump diaphragm spring is weak. Rocker arm or eccentric worn or undersize. Excessive clearance between rocker arm and fuel pump link. Fittings loose or cracked.	Fuel filter clogged (low volume). Fuel line cracked or broken. Fuel pump valves improperly seating. Dirt in fuel tank and/or lines. Fuel tank vent restricted. Diaphragm ruptured. Main body retaining screws loose.
HIGH FUEL PUMP PRESSURE OR VOLUME	Diaphragm spring too strong or improper spring. Diaphragm surface too tight (over-tensioned).	Pump link has no free play (frozen). Diaphragm vent hole is plugged or omitted.
LOW FUEL PUMP VACUUM	Diaphragm stretched or leaking. Fuel pump springs weak. Fuel pump valves improperly seating. Diaphragm ruptured.	Rocker arm or eccentric worn. Excessive clearance between rocker arm and fuel pump link. Main body retaining screws loose.
LOW FUEL PUMP VOLUME WITH NORMAL PRESSURE	Fuel filter clogged. Fuel pump to carburetor inlet line obstructed, crimped or leaks.	Restriction in fuel supply line to fuel pump.
FUEL PUMP LEAKS FUEL	Diaphragm defective. Fittings loose. Threads on fittings stripped.	Body cracked. Diaphragm pull rod oil seal defective.
FUEL PUMP LEAKS OIL	Fuel pump retaining bolts loose.	Mounting gasket defective.
FUEL PUMP NOISE	Rocker arm or eccentric worn. Mounting bolts loose. Rocker arm springs weak or broken.	Diaphragm pull rod bumper pad defective.
FUEL TANK AND/OR INLET LINE HOSES COLLAPSED	Fuel tank vent restricted.	

FIG. 51—Fuel Pump, Tank and Lines Diagnosis Guide

PART 10-2—*Autolite Model 1100 1-V Carburetor*

1 DESCRIPTION AND OPERATION

DESCRIPTION

The carburetor (Figs. 1 and 2) consists of two main assemblies, the main (upper) body and the throttle (lower) body.

The upper body (air horn) assembly contains the major metering components of the carburetor: the main and idle fuel system, which consists of the power valve, float chamber vent, and the fuel inlet system.

The lower body assembly contains: the fuel bowl, the accelerating pump assembly, the idle mixture adjusting screw (needle), and the spark valve. An hydraulic dashpot is also included in the lower body for use on car models that are equipped with an automatic transmission.

This section applies to all carburetors. Differences in carburetor operation are given when they exist.

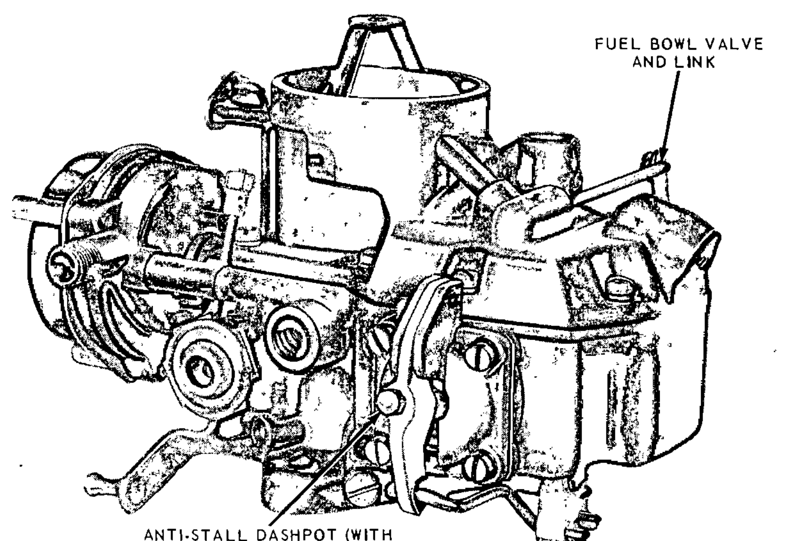


FIG. 1—Autolite Model 1100 1-V Carburetor—Right Front 3/4 View

OPERATION

The engine speed is regulated and controlled by the proportion of fuel and air delivered to the cylinders for all engine operating condition. Operation is based on the principle of pressure differences or vacuum.

Air is drawn into the carburetor air horn by manifold vacuum. As the air passes through the carburetor on its way to enter the cylinders, low pressure is created at the fuel discharge outlets of the carburetor. The fuel bowl is vented to atmospheric and to carburetor air inlet pressure through a vent hole in the upper body assembly. The high air pressure exerted on the fuel in the bowl forces the fuel to travel up through the fuel discharge channels and out into the air stream passing through the carburetor. The fuel and air is mixed at this point and distributed into the engine cylinders for burning.

FUEL INLET SYSTEM

The fuel inlet system (Fig. 3) of the carburetor maintains a predetermined fuel level in the fuel bowl. **The fuel level in the bowl is extremely important to carburetor calibration.** If the level of the fuel in the bowl is below the specified setting, a lean fuel-air mixture will result. A rich fuel-air mixture will occur from a higher than specified fuel level. The entire calibration of the carburetor is disturbed if the fuel level is not set as specified.

Fuel enters the fuel bowl through the fuel inlet needle valve and seat assembly. The amount of fuel entering is regulated by the distance the

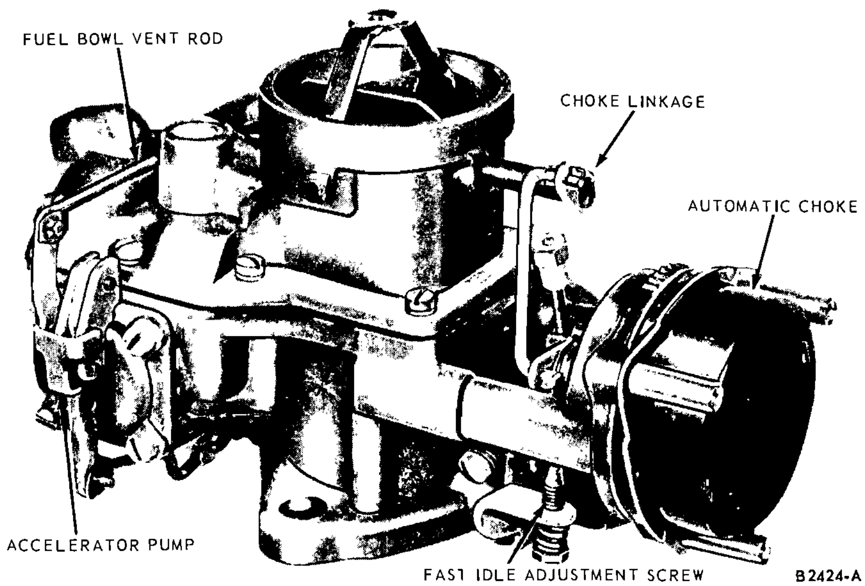


FIG. 2—Autolite Model 1100 1-V Carburetor—Left Rear 3/4 View

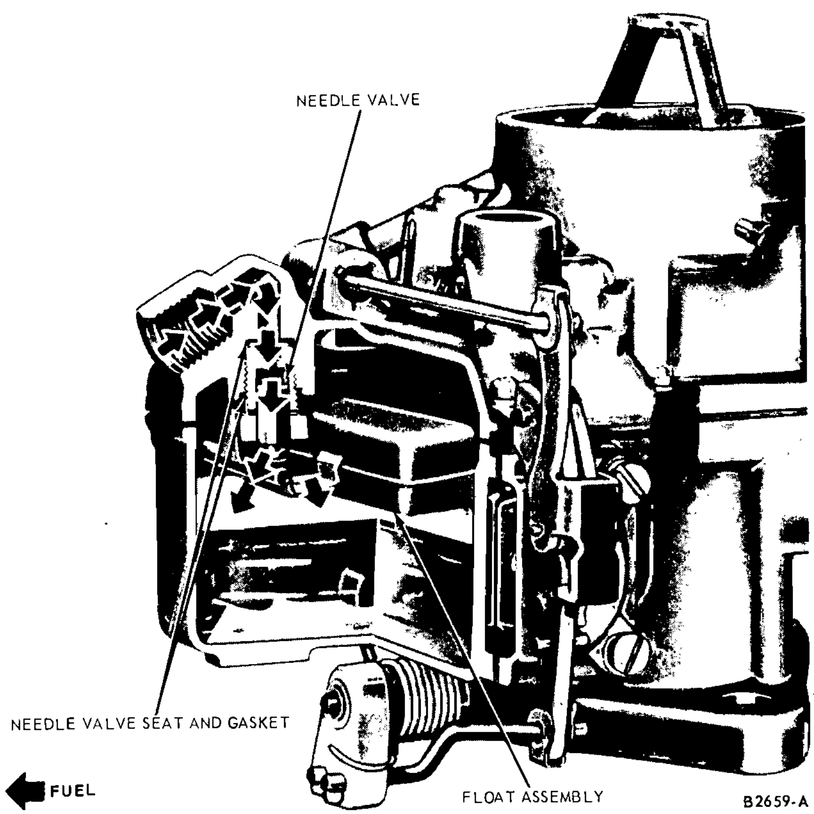


FIG. 3—Fuel Inlet System

needle valve is moved off the seat and by fuel pump pressure. **Correct fuel pump pressure is required to maintain the carburetor fuel level within the specified limits.**

The fuel level is maintained at a predetermined level by the float and lever assembly which controls the movement of the needle valve. The needle valve, riding on the tab of the float and lever assembly, reacts to any change in height of the float and the fuel level in the fuel bowl.

IDLE FUEL SYSTEM

The idle system (Fig. 4) functions when the engine is operating at low rpm. It supplies the fuel-air mixture when the air flow past the carburetor venturi is insufficient to operate the main metering system.

The range of the idle system will extend into the operation of the main metering system. Fuel flows from the main well, up the idle well and through the calibrated idle jet. Filtered air from the carburetor air horn enters the idle air bleed restriction and mixes with the fuel. The air bleed restriction also serves as a vent to prevent syphoning of fuel at high speeds or when the engine is shut-off. The fuel-air mixture then passes down through an idle channel restriction and is transferred to the idle channel in the lower body assembly.

The fuel air mixture passes down the idle channel, past two idle transfer holes, to the idle mixture adjusting screw (needle). The idle transfer holes act as additional air bleeds at normal idle. The fuel air mixture flows past the idle adjusting screw needle and seat and is discharged below the throttle plate. The amount of mixture to be discharged is determined by the position of the idle screw needle in relation to the seat in the lower body passage.

During off-idle operation, when the throttle plate is moved past the idle transfer holes, each hole begins discharging fuel as it is exposed to the lower air pressure (manifold vacuum). Continued opening of the throttle plate increases engine rpm and air flow through the carburetor. The greater air flow past the booster venturi causes a pressure drop in the venturi great enough to bring the main fuel metering system into operation as the idle fuel metering system tapers off.

MAIN FUEL METERING SYSTEM

The main fuel metering system (Fig. 5) supplies the fuel required for engine operation during the cruise or part-throttle range. The system begins to function when the air flow through the carburetor venturi creates sufficient vacuum to start fuel flowing in the main system. The vacuum at the discharge nozzle will increase as the air flow increases. The faster the engine operates, the more fuel will flow through the main fuel system.

Fuel entering the main jet, located at the bottom of the main well, flows up toward the main nozzle. A main well tube is inserted within the main well. Air from the high speed bleed channel enters the main well tube through a calibrated restriction at the top of the tube. The air passes through holes spaced along the tube, mixing with the fuel flowing up the

main well. The fuel and air mixture being lighter than solid fuel, responds faster to changes in venturi pressures. The mixture continues flowing up the main well to the anti-syphon bleed. More air is introduced at the anti-syphon bleed to the fuel and air mixture which is then discharged from the main nozzle. The fuel is mixed with the filtered air moving past and through the booster venturi.

The anti-syphon bleed also acts as a vent to prevent syphoning of fuel at low engine speeds.

ACCELERATING PUMP SYSTEM

Smooth acceleration requires a momentary increase in the supply of fuel. The air flow through the carburetor responds almost immediately to any increase in carburetor throttle valve opening. The fuel within the metering passages will lag momentarily in its response to the pressure difference created by this increased air flow. This lag in fuel response will cause a temporary leanness in the fuel-air mixture that results in a hesitation in engine acceleration. A mechanically operated accelerating pump system (Fig. 6) supplies added fuel to provide a richer fuel-air mixture for this brief period of time.

The accelerating pump, located on the side of the lower body assembly, is actuated by linkage connected to the throttle shaft. When the throttle is opened on acceleration, the diaphragm forces fuel from the accelerating pump chamber into the discharge channel. The inlet ball check closes to prevent a reverse flow of fuel. Fuel under pressure forces the outlet ball check valve and the weight off its seat, allowing fuel to pass up to the discharge nozzle. The fuel is sprayed from the nozzle into the air stream above the main venturi.

When the throttle plate is closed on deceleration, a return spring forces the diaphragm back, drawing fuel through the inlet channel. The inlet ball check opens, allowing fuel to pass into the chamber while the outlet ball check closes preventing entry of air. A bleed hole is located in the body casting to allow vapor and excess pressure to escape from the diaphragm chamber.

POWER FUEL SYSTEM

When the engine is required to deliver more power to meet an increased road load demand or wide-open throttle operation, the carburetor must deliver a richer fuel-air mixture than supplied during the

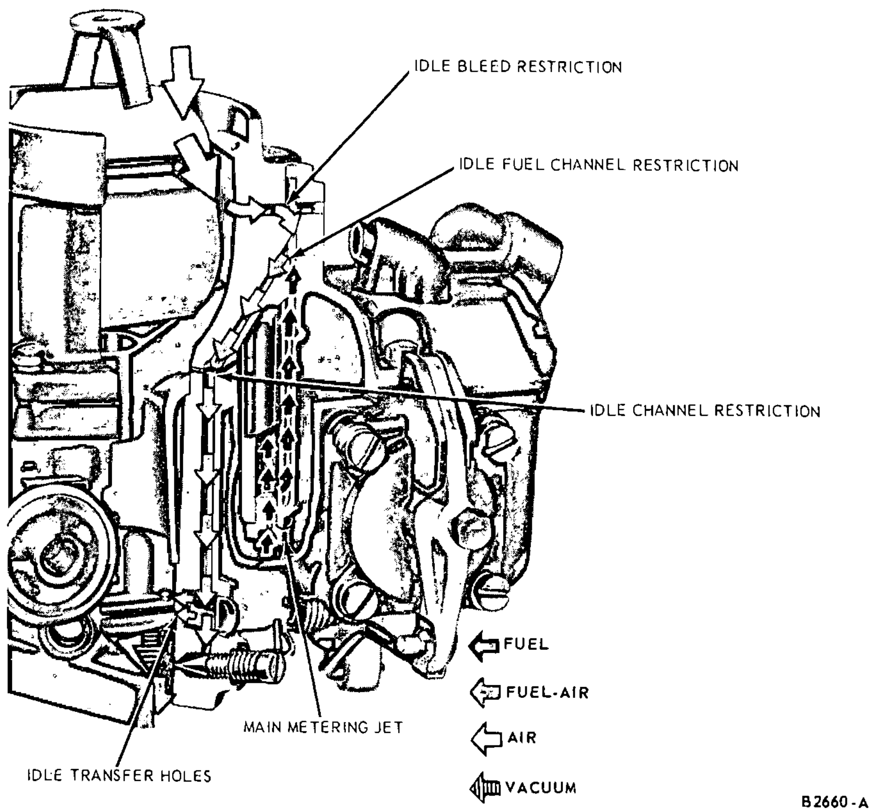


FIG. 4—Idle Fuel System

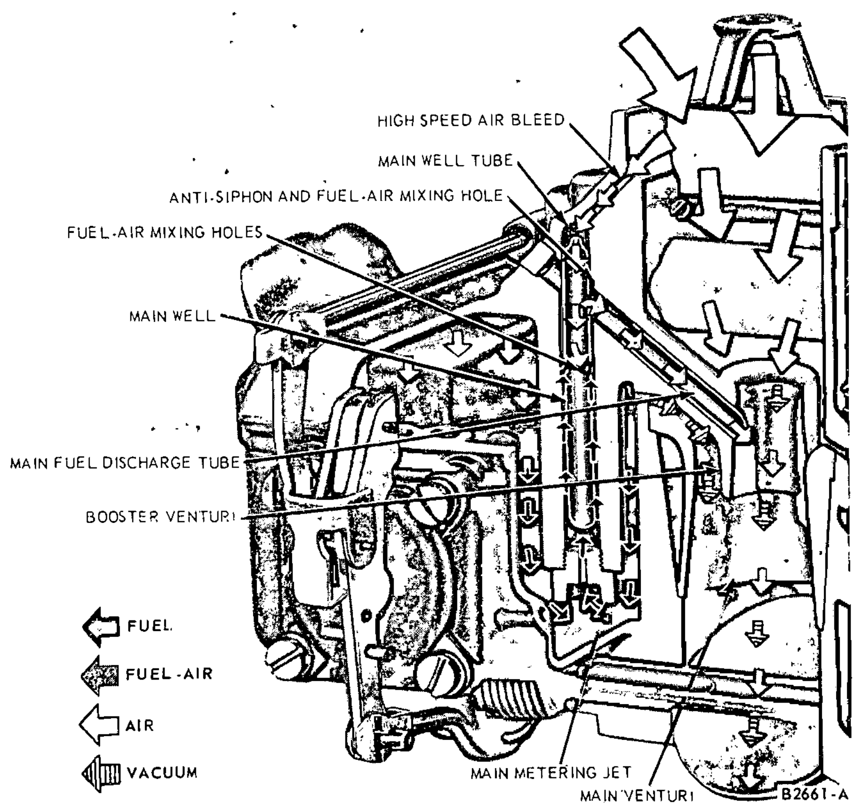


FIG. 5—Main Metering System

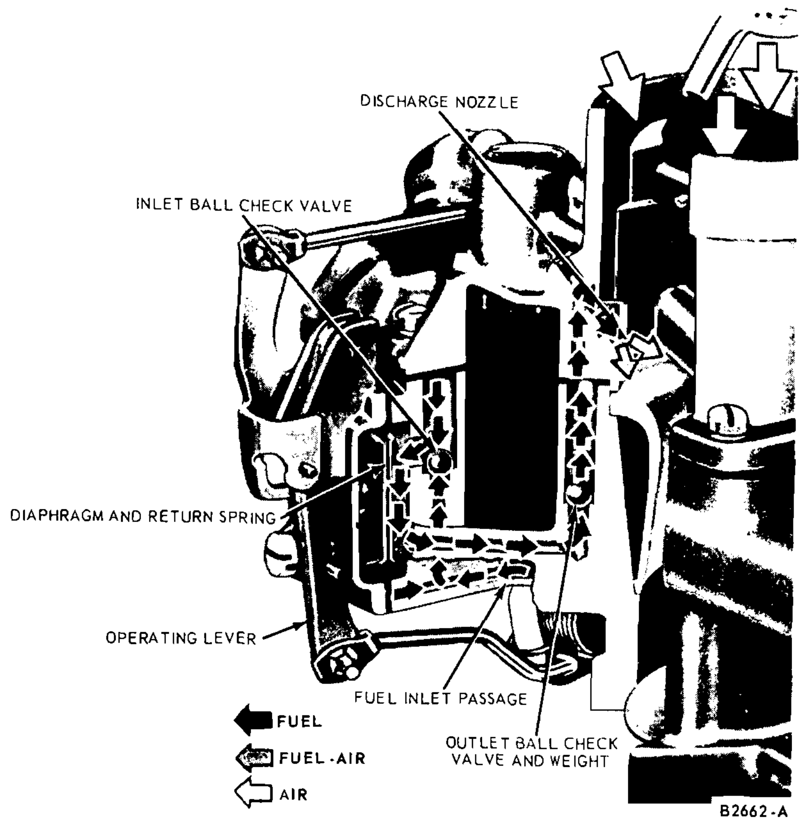


FIG. 6—Accelerating Pump System

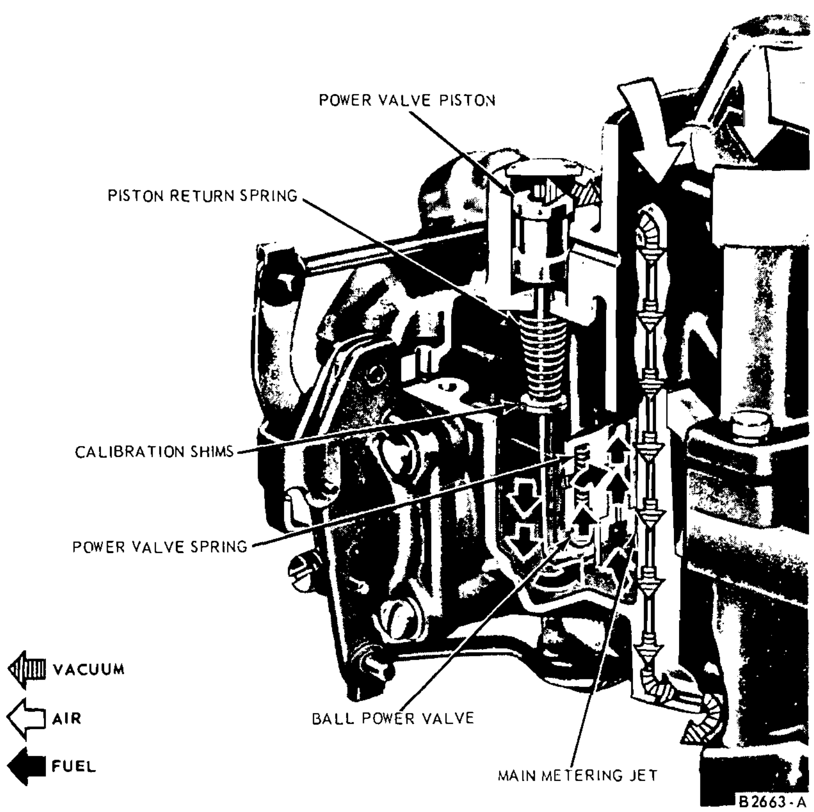


FIG. 7—Power Valve and Fuel Enrichment System

operation of the main fuel system at cruise or part throttle operation. When the engine is running under a high power demand, intake manifold vacuum is low. The vacuum below the carburetor throttle plate approximates intake manifold vacuum. The carburetor power valve (Fig. 7) will open when the manifold vacuum drops below a predetermined value. The fuel-air mixture is thus automatically enriched to meet the increased engine power demands.

Manifold vacuum is transmitted from an opening below the throttle plate, through a channel to the upper body assembly and to the top of the power valve piston. At idle and normal engine speeds, the manifold vacuum is great enough to hold the power valve piston up.

The power valve rod is connected to the piston. The foot of the rod controls the spring-loaded power valve ball check. With the piston held up by manifold vacuum, the ball check closes the power jet inlet channel.

A power valve spring is located on the rod. The spring is shim calibrated to overcome the vacuum above the piston when manifold vacuum drops below a predetermined level. Upon demand for more power, the manifold vacuum drops below this level. The spring tension moves the rod down and allows the power valve ball check to open. Air pressure above the fuel bowl forces fuel to flow through the power jet, adding to fuel in the main fuel system, enriching the fuel-air mixture.

As the demand for power decreases and manifold vacuum increases, the vacuum above the piston overcomes the spring tension. The piston and rod move up and the ball check closes the power jet channel.

Automatic Choke System

The automatic choke system (Fig. 8) provides the proper choking action required to enrich the fuel-air mixture during the engine warm up period. This is accomplished primarily through the use of a bimetal thermostatic coil spring. The automatic choke control assembly is mounted on the lower body assembly and linked to the choke shaft lever by the choke control rod.

The bimetal thermostatic spring winds up when cold and unwinds when warm. When engine is cold, the thermostatic spring, through attaching linkage, holds the choke plate in a closed position. A cold engine is started by opening the throttle fully to permit the pressure ex-

erted by the bimetal spring to close the choke plate when the engine is cold. A fast idle cam is also rotated into position by the automatic choke lever and through a torsion spring to contact the fast idle adjusting screw.

The throttle is returned to a partially opened position and the engine is cranked. When the engine starts running, the spring action of the bimetal spring will permit partial opening of the choke plate. As the throttle is returned to the idle position, the pulldown rod opens the choke plate mechanically to a calibrated setting. The fast idle screw, attached to the throttle lever, increases the engine idle speed for smoother running when the engine is cold.

A cold engine is started by opening the throttle fully to permit the pressure exerted by the bi-metal spring to close the choke plate. A fast idle cam is also rotated into position by the automatic choke lever and torsion spring to contact the fast idle adjusting screw. The throttle is then returned to a partially opened position and the engine is cranked. When the engine starts running, the spring action of the bimetal spring will permit partial opening of the choke plate.

As the throttle is returned to the idle position, the pull-down rod opens the choke plate mechanically to a calibrated setting and the fast idle screw, attached to the throttle lever, increases the engine idle speed for smoother running when the engine is cold.

During driveaway, increased air flow will result in increased pressure on the choke plate, causing the choke plate to partially open against the force of the bimetal spring, thereby controlling fuel-air mixture in response to engine demand.

As the engine continues to run, manifold vacuum, channeled through a passage on the bottom of the lower body to the choke housing, draws heated air from the exhaust manifold heat chamber through the thermostatic choke control outlet line connected to the choke housing. The amount of air entering the choke housing is controlled by restriction of air channels in the carburetor.

The warmed air from the heat chamber enters the choke housing and heats the thermostatic spring, causing it to warm up. Tension of the thermostatic spring gradually decreases as the temperature of the air from the heat chamber rises, allowing the choke plate to open. The air in the choke housing is exhausted into the intake manifold.

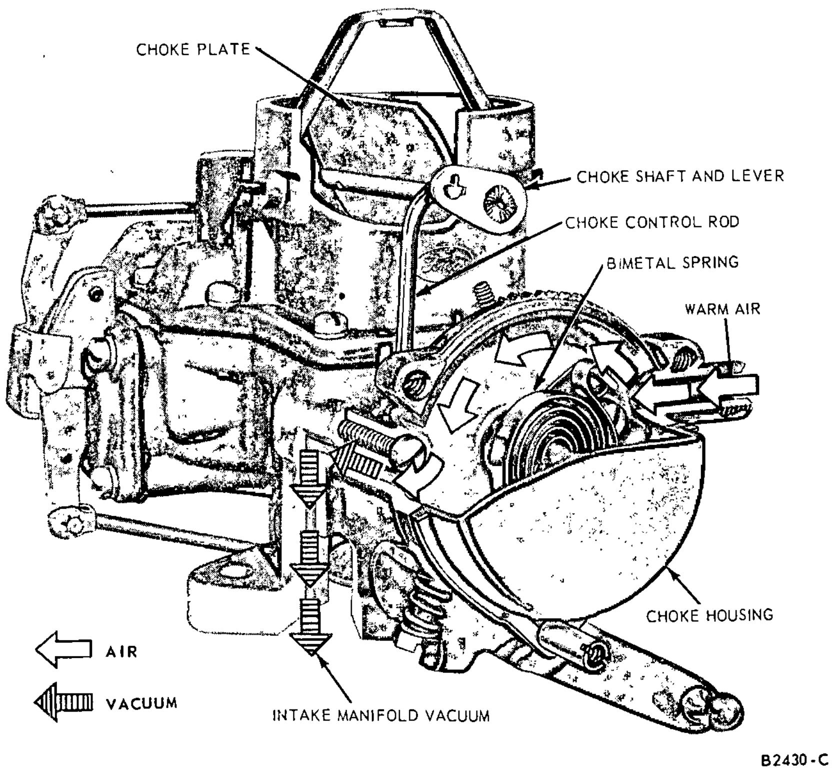


FIG. 8—Automatic Choke System

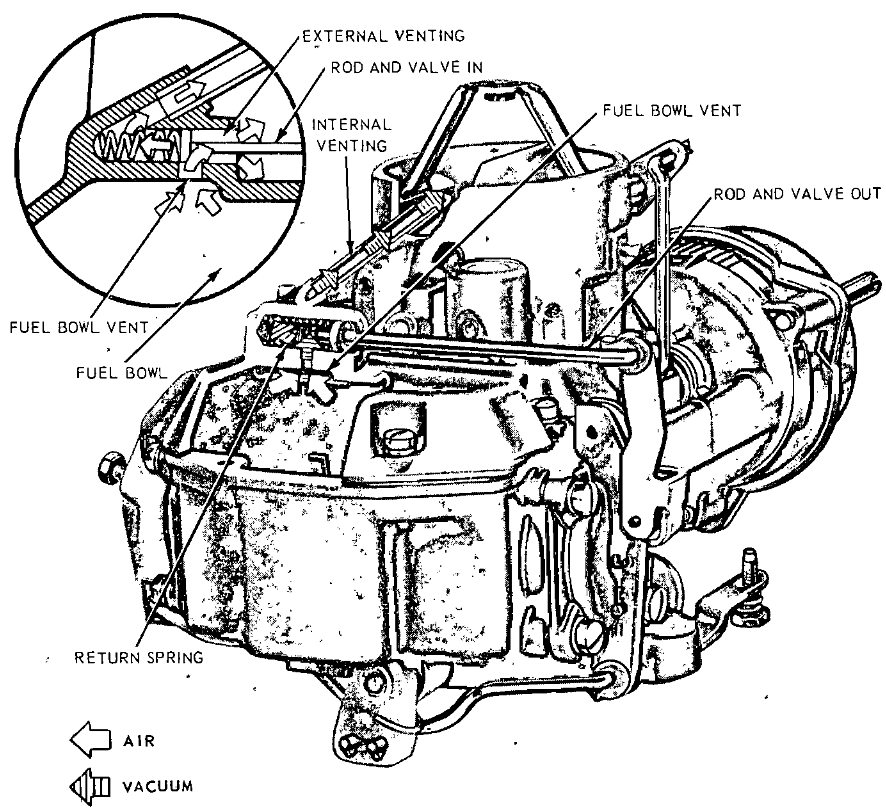


FIG. 9—Fuel Bowl Venting System

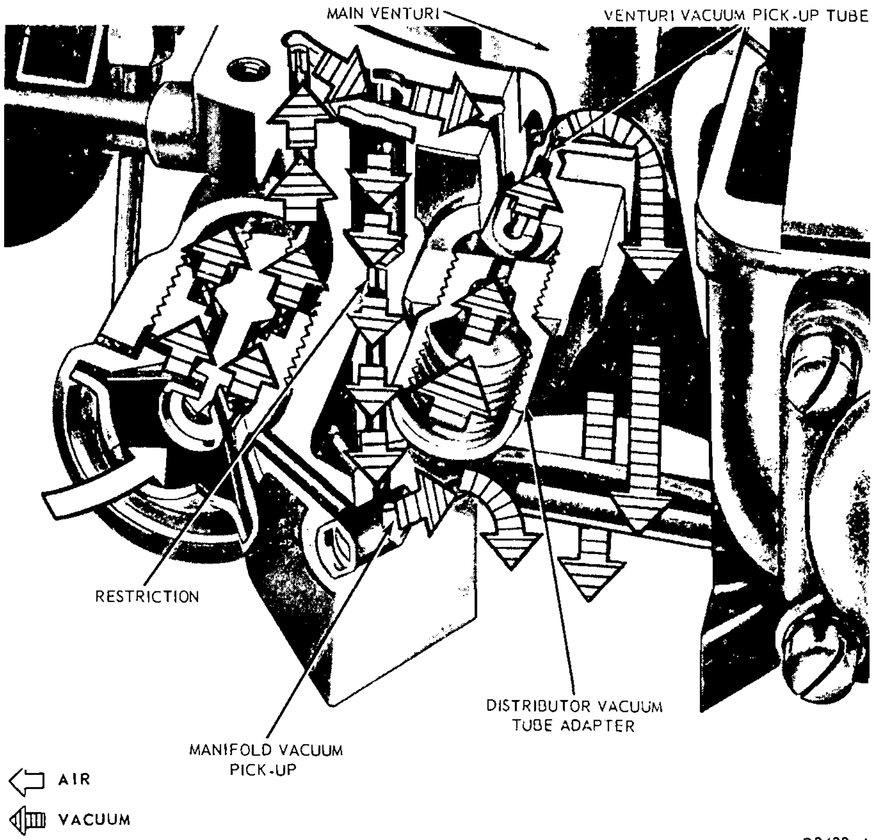


FIG. 10—Spark (Distributor Vacuum) Control System

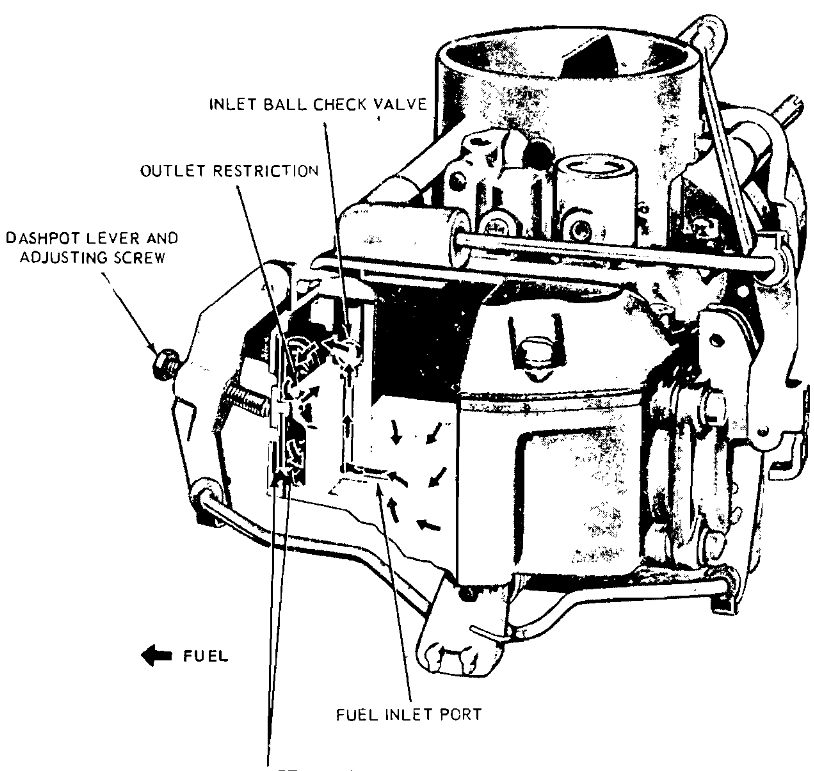


FIG. 11—Anti-Stall Dashpot

When the engine reaches its normal operating temperature, the spring exerts full tension on the choke plate, forcing it to the full open position.

When the choke plate is partially or fully closed, a fast idle cam is rotated into position to contact the fast idle adjustment screw. The screw, attached to the throttle lever, permits a faster engine idle speed for smoother running when the engine is cold. The thermostatic choke lever and torsion spring rotates the fast idle cam to lower the engine idle speed when the engine temperature rises and choking is reduced.

The throttle lever and pull-down rod partially opens the choke plate when the accelerator pedal is fully depressed. This permits unloading a flooded engine.

FUEL BOWL VENT SYSTEM

The fuel bowl requires venting (Fig 9) to provide proper operation for the various systems. Fuel vapors may form in the fuel bowl when a hot engine is stopped, idling, or operating at very low speeds. By venting the fuel bowl to the atmosphere by means of a vent control valve, engine performance is improved. At higher engine speeds, venting to the carburetor air horn prevents calibration changes due to normal air cleaner contamination.

The restriction of air due to air cleaner contamination causes a pressure drop in the carburetor air horn, and a richer air-fuel mixture. The pressure drop will increase as demand for air (engine speed) is increased.

The vent control valve, connected through linkage to the throttle shaft and located in a bore over the fuel bowl, is at the inward position during closed or part throttle operation. In this position, the valve allows venting only to the atmosphere. At normal or wide-open throttle operation the valve moves outward, sealing the external vent and opening the vent to the carburetor throat.

SPARK (DISTRIBUTOR VACUUM) CONTROL SYSTEM

The degree of spark advance in the distributor is determined by the strength of the vacuum acting on the distributor diaphragm. A high vacuum will increase spark advance. The carburetor is calibrated to provide the required vacuum to the distributor through an interaction of venturi vacuum and manifold vacuum. Venturi vacuum is obtained through the pick-up tube in the main venturi and is supplied to the distributor only when

it exceeds manifold vacuum (Fig. 10).

Manifold vacuum supplied to the distributor, is obtained from a pick-up hole at the throttle plate edge (when the throttle is closed) and metered to the distributor. An additional passage is always open to manifold vacuum. The purpose of the additional passage is to provide a higher spark advance at closed throttle during deceleration to promote complete burning of the fuel and greater efficiency.

Metering of the manifold vacuum to the distributor is accomplished through the use of the spark valve and restrictors in the vacuum channels. The spark valve is held open through the combination of vacuum and atmospheric pressure acting on the spark valve diaphragm to overcome the tension of a calibrated spring in the spark valve.

Calibrated restrictors in the manifold vacuum channels limit the flow of manifold vacuum to the distributor. Also, during low manifold vacuum periods, the bypass restrictor controls the reduction of venturi vacuum caused by bleed back.

At off-idle engine speeds, vacuum at the throttle edge is high due to a venturi effect created by the position of the throttle plate in the throttle bore. The high vacuum in this area is supplied to the distributor through the manifold vacuum channels for the required increase in distributor spark advance.

Upon acceleration and under wide-open throttle operation, manifold vacuum drops. When the manifold vacuum falls below a predetermined point, the spark valve closes, shutting off the manifold vacuum to the distributor. The drop in distributor vacuum retards the spark advance. Venturi vacuum, now greater than manifold vacuum, supplies vacuum to the distributor, thus preventing a full spark retard.

As the engine load demands decrease, the increase in manifold vacuum will become greater than venturi vacuum. The increased manifold vacuum opens the spark valve and the higher vacuum now supplied to the distributor increases the spark advance for more efficient engine operation.

DASHPOT SYSTEM

The low idle rpm setting on automatic transmission equipped units requires a means of control to prevent engine stall upon sudden closing of the throttle plate. This is accomplished by hydraulic dampening of the throttle closing rate.

The dashpot, located on the side of the fuel bowl, is actuated by linkage connected to the throttle shaft (Fig. 11). When the throttle is opened a return spring forces the diaphragm back, drawing fuel through the inlet channel. The inlet ball check opens, allowing fuel to flow into the dashpot chamber.

When the throttle plate is closed, the dashpot actuating lever and adjusting screw moves the diaphragm inward. The diaphragm moving inward seats the inlet ball check, closes the inlet channel and forces fuel through a restriction into the fuel outlet channel into the bowl. The discharge restriction limits the flow of fuel and slows the closing of the throttle plate.

2 REMOVAL AND INSTALLATION

REMOVAL

Flooding, stumble on acceleration and other performance complaints are, in many instances, caused by the presence of dirt, water, or other foreign matter in the carburetor. To aid in diagnosing the complaint, the carburetor should be carefully removed from the engine without removing the fuel from the bowl. The contents of the bowl may then be examined for contamination as the carburetor is disassembled.

1. Remove the air cleaner from the air horn of the carburetor (Part 10-5, Section 2).

2. Disconnect the clean air tube, accelerator return spring, accelerator linkage, automatic choke heat tube, in-line fuel filter and the distributor vacuum line.

3. Remove the carburetor to intake manifold retaining nuts. Remove the carburetor, spacer and the upper and lower spacer gasket. Discard the gaskets.

INSTALLATION

1. Clean the gasket surfaces of the carburetor, intake manifold and spacer. Position the spacer between 2 new gaskets and position them on the intake manifold.

2. Install the carburetor and tighten the retaining nuts, evenly and alternately, to specification.

3. Connect the distributor vacuum line, in-line fuel filter, automatic choke heat tube, clean air tube, accelerator linkage and the accelerator return spring.

4. Adjust the idle fuel mixture and engine idle speed, and the anti-stall dashpot (automatic transmission), if so equipped. Refer to Common Adjustments and Repairs (Part 10-1, Section 2) for the proper procedures.

3 MAJOR REPAIR OPERATIONS

DISASSEMBLY

Use a separate container for the component parts of the various assemblies to facilitate cleaning, inspection and assembly.

The following is a step-by-step sequence of operations for completely overhauling the carburetor; however, certain components of the carburetor may be serviced without a complete disassembly of the entire unit.

AUTOMATIC CHOKE

1. Remove the choke pull-down rod to throttle lever retainer (Fig. 12). Remove the rod from the lever.

2. Remove the choke thermostatic spring housing to choke housing retaining screws. Remove the thermostat spring housing clamp, housing and the gasket.

3. Remove the choke housing to lower the body retaining screws. Rotate the choke housing to disconnect the choke control rod and remove the choke housing and the gasket.

4. Remove the choke control lever

to thermostatic choke shaft screw. Remove the choke control lever assembly and the spring. Slide the choke shaft out of the choke housing.

5. Remove the choke control rod from the lever.

6. Remove the choke pulldown rod adjusting nut from the rod. Slide the rod out of the swivel.

UPPER AIR HORN AND LOWER BODY

1. Depress the tang on the fuel bowl vent rod to accelerating pump actuating lever retainer (Fig. 12), and disconnect the vent rod from the lever. Remove the fuel bowl vent rod to accelerating pump actuating lever retainer (Fig. 12).

2. Remove the upper to lower body retaining screws and the carburetor identification tag. Separate the upper body assembly, gasket and lower body assembly (Fig. 12). Discard the gasket.

3. Invert the lower body assembly and allow the accelerating pump discharge weight and ball check, the accelerating pump inlet ball check, and the dashpot ball check, if so equipped, to fall into the hand.

UPPER BODY (AIR HORN)

1. Remove the float retaining pin and the float assembly (Fig. 12).

2. Remove the fuel inlet needle valve. Remove the needle valve seat and gasket. Discard the gasket.

3. Remove the main jet.

4. Remove the air cleaner bracket retaining roll pins with pliers. Turn them in a direction that will coil the pins to a smaller diameter. If they offer resistance to turning, turn them in the opposite direction. Pull the bracket out of the retaining channels.

5. If it is necessary to remove the choke plate and shaft, lightly scribe the choke along the choke shaft so that the choke plate can be installed in the same position during installation.

Remove the choke plate screws. The retaining screws are staked in the choke shaft. If the tips of the screws are flared excessively, file off the flared portion to avoid damage to the threads in the choke shaft. Be careful not to damage the choke shaft or venturi while filing the screws. Remove the choke plate from the top of the air horn by sliding the plate out of the shaft. Slide the shaft out of the body.

FUEL VENT VALVE ROD

1. Remove the stake marks at the vent rod opening with a scraper or file.

2. Remove the vent rod assembly and spring by pulling the vent rod outward.

LOWER BODY

1. Depress the tab on the accelerating pump lever to control rod retaining clip and slide the rod out of the lever (Fig. 12). Remove the clip from the lever.

2. Remove the accelerating pump cover retaining screws. Remove the cover assembly from the lower body. Separate the pump diaphragm and spring from the cover or lower body.

If necessary, remove the fuel vent rod actuating lever to cover retaining pin and the accelerating pump lever to cover retaining pin with pliers. Turn them in a direction that will coil the pins to a smaller diameter. If the pins offer resistance to turning, turn them in the opposite direction. Remove the levers from the cover.

3. If the carburetor is equipped with a dashpot, depress the tab on the dashpot lever and control rod retaining clip, and slide the rod out of the dashpot lever. Remove the dashpot cover retaining screws and remove the cover assembly. Separate the diaphragm and spring from the cover or body.

If necessary, remove the lever to cover retaining pin with pliers. Turn the pin in a direction that will coil the pin to a smaller diameter. If the pin offers resistance to turning, turn it in the opposite direction and remove the lever from the cover.

4. Remove the throttle shaft lever and retaining ring and washer. Remove the lever and overtravel spring from the throttle shaft. Remove the accelerator pump and dashpot control rods from the lever.

5. Remove the distributor vacuum outlet adapter.

6. Remove the spark valve and gasket.

7. Remove the idle mixture adjusting screw and spring.

8. If it is necessary to remove the throttle plate and shaft, lightly scribe the throttle plate along the throttle shaft so that the throttle plates can be installed in the same position during installation.

Remove the throttle plate retaining screws and slide the plate out of the shaft. For assembly purposes, note that the dimple in the throttle plate is located below the throttle shaft. **The retaining screws are staked in the throttle shaft.** If the tips of the screws are flared excessively, file off the flared portion to avoid damage to the threads in the throttle shaft. **Be careful not to damage the throttle shaft or venturi while filing the screws.**

9. Remove the overtravel spring tension pin from the throttle shaft and slide the shaft out of the body.

CLEANING AND INSPECTION

Clean and inspect the carburetor component parts. Refer to Part 10-1, Section 3, for the proper procedure. Replace all worn or damaged parts.

ASSEMBLY

Make sure all holes in the new gaskets have been properly punched and that no foreign material has adhered to the gaskets.

During assembly of the carburetor, certain adjustments are required. The details of these adjustments are covered in Part 10-1, Section 2, under Common Adjustments and Repairs.

A disassembled view of the carburetor is shown in Fig. 12.

FUEL VENT VALVE ROD

1. Insert the fuel vent valve return spring in the fuel vent passage in the upper body (Fig. 12). Insert the piston end of the fuel vent rod in the passage.

2. Punch three indentations in the vent valve passage opening with a center punch and a hammer. The indentations must distort the inside edge of the opening sufficiently to act as a stop for the piston end of the vent rod. Perform a Vent Valve Adjustment after the carburetor is assembled and installed on the vehicle (Part 10-2, Section 2).

UPPER BODY (AIR HORN)

1. If the choke plate and the shaft were removed, insert the choke shaft assembly into the air horn with the lever pointing toward the accelerating pump side of the carburetor (Fig. 12).

Refer to the line previously scribed on the choke plate and insert the choke plate into its original position with the plate indentation facing upward and toward the accelerating pump side of the carburetor. Install the choke plate retaining screws snug, but not tight.

Check for proper plate fit, binding in the air horn and free rotation of the shaft by moving the plate from the closed position to the open position. If it moves freely, tighten

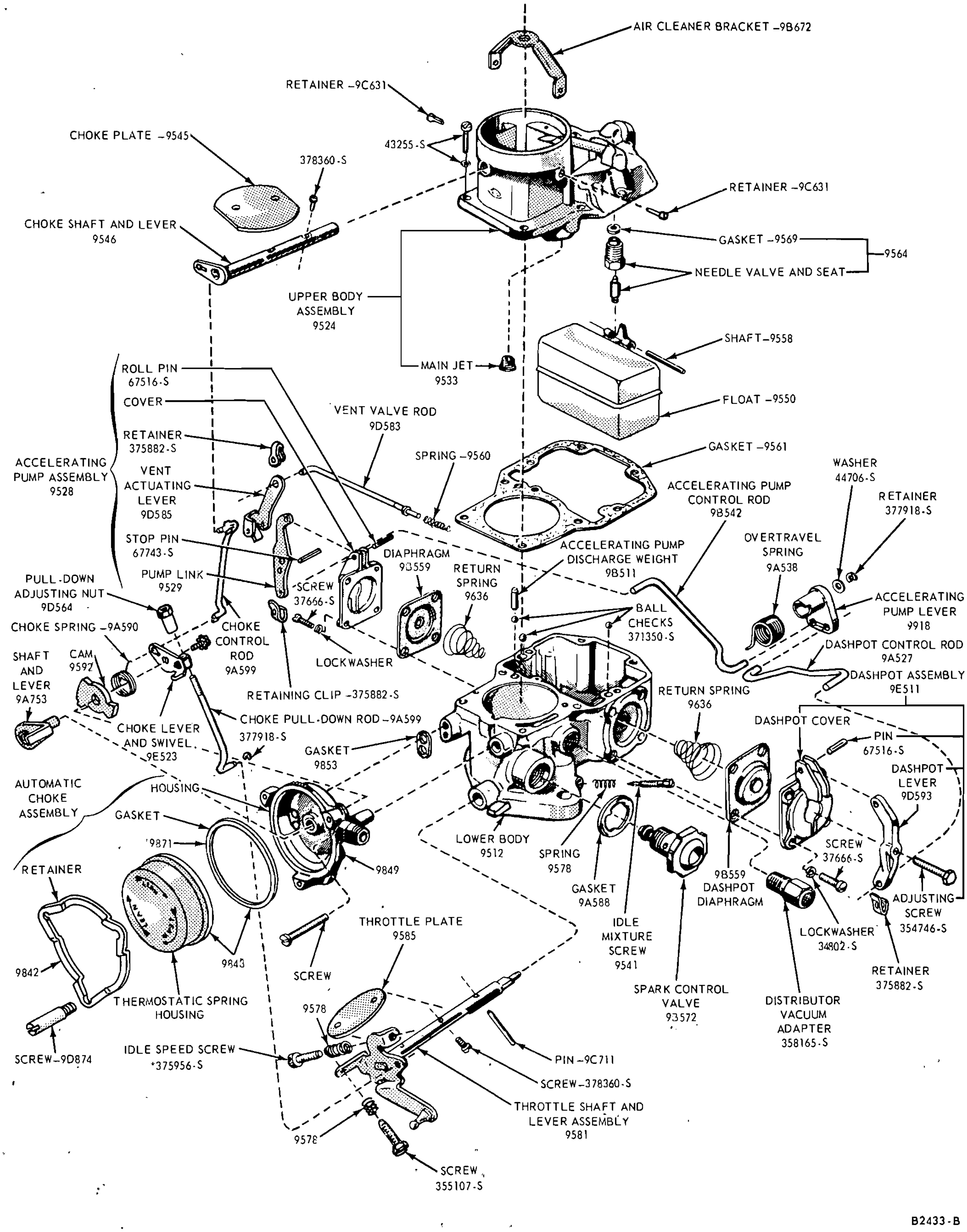


FIG. 12—Autolite Model 1100 1-V Carburetor Assembly

the choke plate retaining screws while holding the plate in the fully-closed position. Stake the screws. **When staking the screws, support the shaft and plate on a block of wood or a metal bar to prevent bending of the shaft.**

2. Install the main jet in the main fuel well.

3. Install the needle valve seat gasket and the seat within the tapped seat hole. Tighten the needle valve seat firmly. Insert the needle valve into the needle valve seat, with the viton tip toward the seat.

4. Position the float assembly in the body, with the tab on the arm located over the needle valve and the hinge of the arm lined up between the hinge bracket holes in the upper body casting. Insert the float hinge pin through the holes in the upper body and float assembly.

5. Check the float setting. Refer to Common Adjustments and Repairs (Part 10-1, Section 2) for the proper procedure.

6. Insert the air cleaner bracket in the channels of the air horn and install the bracket retaining pins.

LOWER BODY

1. If the throttle plate and shaft were removed, slide the throttle shaft into the lower body, with the lever on the throttle shaft located opposite the fuel bowl and the fast idle adjusting screw facing upward (Fig. 12).

Refer to the line previously scribed on the throttle plate and insert the plate through the slot in the throttle shaft. The plate indentation must face the bottom of the body and point toward the accelerator pump side of the lower body. Install the throttle plate screws snug, but not tight.

Rotate the throttle shaft while lightly tapping the throttle plate within the throttle bore. Check for free rotation of the throttle shaft. Hold the lower body up to the light. **Little or no light should show between the throttle plate and throttle bore.** When the plate is properly located, hold the throttle plate closed; then, tighten and stake the retaining screws. **When staking the screws, support the shaft and plate on a block of wood or a metal bar to prevent bending of the shaft.**

2. Install the distributor vacuum outlet fitting.

3. If the lever was removed from the accelerating pump cover, position the top hole of the lever between the top bracket holes in the cover; then, install the retaining roll pin.

Position the vent rod lever over the accelerating pump cover bracket. Line up the hole in the lever with the holes in the bracket and install the retaining roll pin.

Install the roll pin in the HI (lower) stop hole in the lever.

Position the small diameter end of the diaphragm return spring in the boss in the accelerating pump chamber. Position the diaphragm assembly in the accelerating pump cover, with the diaphragm plunger facing the lever, and line up the holes. Position the cover and diaphragm over the return spring and onto the body. Install the cover retaining screws finger-tight. Push the diaphragm assembly inward with the lever and tighten the cover screws.

4. If the carburetor is equipped with a dashpot (Fig. 12), proceed with the following steps:

If the lever was removed from the dashpot cover, position the hole in the lever between the holes in the bracket on the cover. Install the lever retaining roll pin. Install the adjusting screw in the lever, if necessary.

Position the small diameter of the diaphragm return spring on the boss in the dashpot chamber. Position the diaphragm in the dashpot cover with the diaphragm plunger facing the lever, and line up the holes. Position the cover and the diaphragm over the return spring and onto the body. Install the cover retaining screws finger tight. Push the diaphragm assembly inward with the lever and tighten the cover screws.

5. Position the overtravel spring (Fig. 12) on the accelerating pump lever and hook the tang of the spring on the lever. Position the accelerating pump lever and spring on the throttle shaft and insert the accelerating pump actuating rod and dashpot actuating rod, if so equipped, into the two holes in the lever.

6. Install the overtravel tension spring retaining pin in the throttle shaft. Pull the arm of the spring over the retaining pin to apply spring tension to the overtravel lever. Install the washer and retaining clip on the throttle shaft. Insert the keyed end of the accelerating pump actuating and the dashpot actuating rod (if so equipped) into the inboard side of the slotted holes in the accelerating pump lever.

7. Position the accelerating pump actuating rod retaining clip over the hole in the accelerating lever, with the tab side of the clip toward the carburetor barrel (Fig. 12). Depress the tab and insert the shorter end of the rod through the lever and clip. Release the tab when the rod is inserted. Perform the Accelerating Pump Adjustments (Part 10-1, Section 2) after the carburetor is assembled.

8. If the carburetor is equipped with a dashpot, position the dashpot actuating rod retaining clip over the hole in the dashpot lever, with the tab side of the clip facing toward the carburetor barrel (Fig. 12). Depress the tab and insert the shorter end of the rod through the lever and clip, then release the tab when the rod is inserted. Perform an Anti-Stall Dashpot Adjustment (Part 10-1, Section 2); after the carburetor is assembled.

9. Position the new spark valve gasket over the spark valve and screw the valve into the lower body (Fig 12). Tighten the valve securely. **A loose valve will cause poor engine operation.**

10. Install the idle mixture adjusting screw and spring in the lower body (Fig. 12). Perform the Preliminary Idle Mixture Setting (Part 10-1, Section 2) after the carburetor is assembled.

UPPER (AIR HORN) TO LOWER BODY ASSEMBLY

1. Place the ball check and the accelerating pump weight into the lower body accelerating pump outlet passage (Fig. 12). Insert a ball check in the accelerating pump inlet passage.

2. If the carburetor is equipped with a dashpot, insert a ball check-in the dashpot inlet passage (Fig. 12).

3. Install the new upper to lower body gasket onto the lower body. **Make certain the word "TOP"** (inscribed on the gasket) is facing upward. Position the upper body on the lower body and gasket. **During the installation, observe the float shaft to make certain it does not dislodge.** Install the upper to lower body retaining screws and the carburetor identification tag. Tighten the screws.

4. Position the fuel vent valve rod retaining clip over the hole in the actuating lever, with the tab side of the clip toward the carburetor air horn. Depress the tab on the clip and connect the rod to the actuating lever. Release the tab.

AUTOMATIC CHOKE

1. When facing the cam side of the choke housing (Figs. 12 and 13), position the choke shaft spring over the bushing hub with the hook of the spring on the fast idle cam finger (spring windup will rotate the cam counterclockwise).

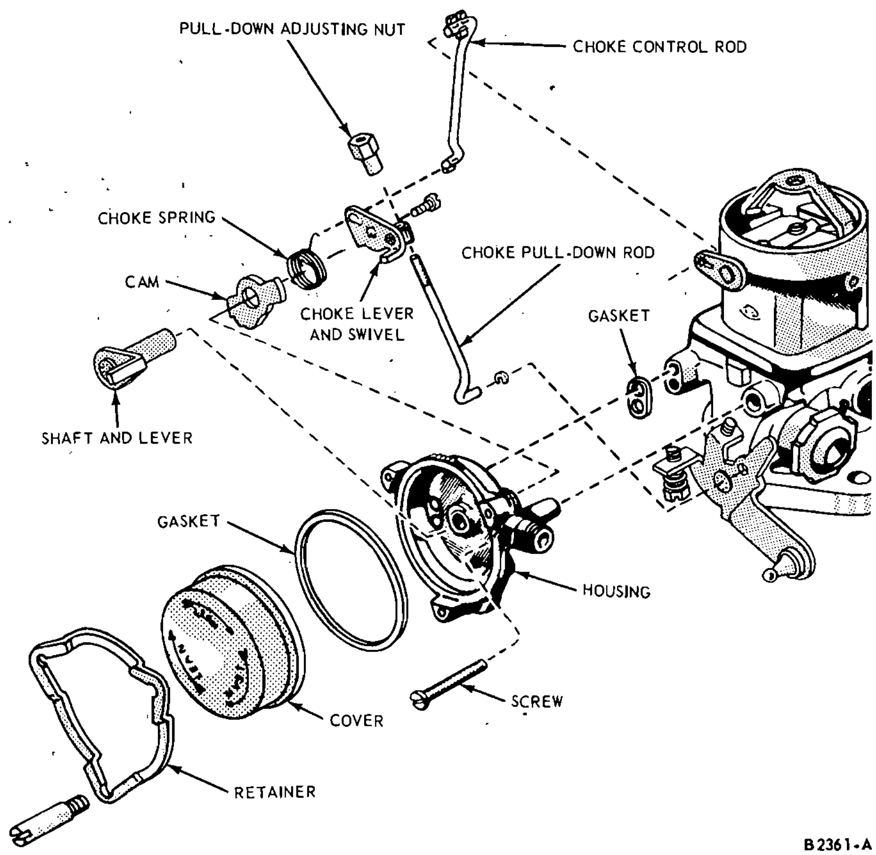


FIG. 13—Automatic Choke Linkage

choke control lever over the fast idle cam, with the pulldown swivel away from the housing and the short tang between the cam finger and the spring straight end.

2. Hold the cam finger clockwise and against the stop of the housing, then rotate the spring counterclockwise until the spring straight end passes the cam finger. Position the choke control lever over the fast idle cam, with the pulldown swivel away from the housing and the short tang between the cam finger and the spring straight end.

3. Insert the thermostatic choke shaft assembly into the choke housing from the bimetal spring side of the housing and into the choke control lever (the pull-down swivel and the thermostatic spring arm should be aligned and not opposite), and install the retaining screw.

4. Insert the threaded end of the choke pull-down rod through the swivel (from the bottom) and install the adjusting nut.

5. Position the short end of the choke control rod into the keyhole in the choke housing choke lever.

6. Insert the choke assembly retaining screws into the choke housing. Position the choke housing to main body gasket and the choke housing onto the lower body, connecting the control rod to the choke plate shaft. Start the retaining screws into the body.

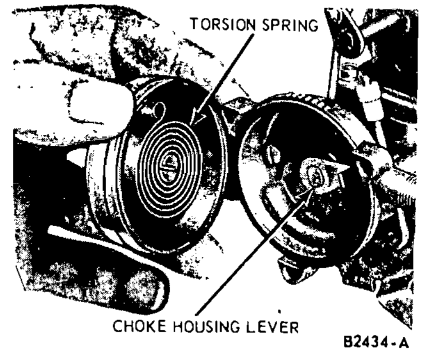


FIG. 14—Correct Position of Automatic Choke Torsion Spring

7. Insert the end of the choke pull down rod into the front of the throttle shaft lever hole and install the retainer.

8. Check the position of the choke housing to main body gasket and tighten the retaining screws.

9. Position the thermostatic spring, housing, gasket and cover to the choke housing, making sure the loop at the end of the thermostatic spring is on the choke lever (Fig. 14). The spring must wind clockwise toward the center when viewed from the choke housing side of the carburetor. Loosely install the spring housing clamp and the retaining screws. Rotate the spring housing in a counterclockwise (rich) direction and align the index mark on the spring housing with the specified index mark (Part 10-1, Section 2) on the choke housing. Tighten the thermostatic spring housing clamp retaining screws.

10. Perform the Automatic Choke Plate Clearance (Pull-Down) and Fast Idle Cam Linkage Adjustment (Part 10-1, Section 2).

PART 10-3—Carter Model YF 1-V Carburetor

1 DESCRIPTION AND OPERATION

The carburetor that is used on the 170 and 200 CID improved combustion (IMCO) system equipped engines is a Carter Model YF, single-venturi carburetor (Fig. 1 and 2).

DESCRIPTION

The carburetor is made up of three main assemblies: the air horn, the main body and throttle body.

The air horn, which serves as the main body cover, contains the choke plate, a vent for the fuel bowl, automatic choke thermostatic control and the fuel inlet fitting, inlet needle and seat and the float and lever assembly. The anti-stall dashpot is attached to the air horn by means of a bracket.

The main body contains the accelerating pump assembly, metering rod jet, low-speed jet, accelerating pump check needle, an anti-percolator and nozzle.

The throttle body contains the throttle plate, throttle shaft and lever, idle mixture adjusting screw and choke connector rod.

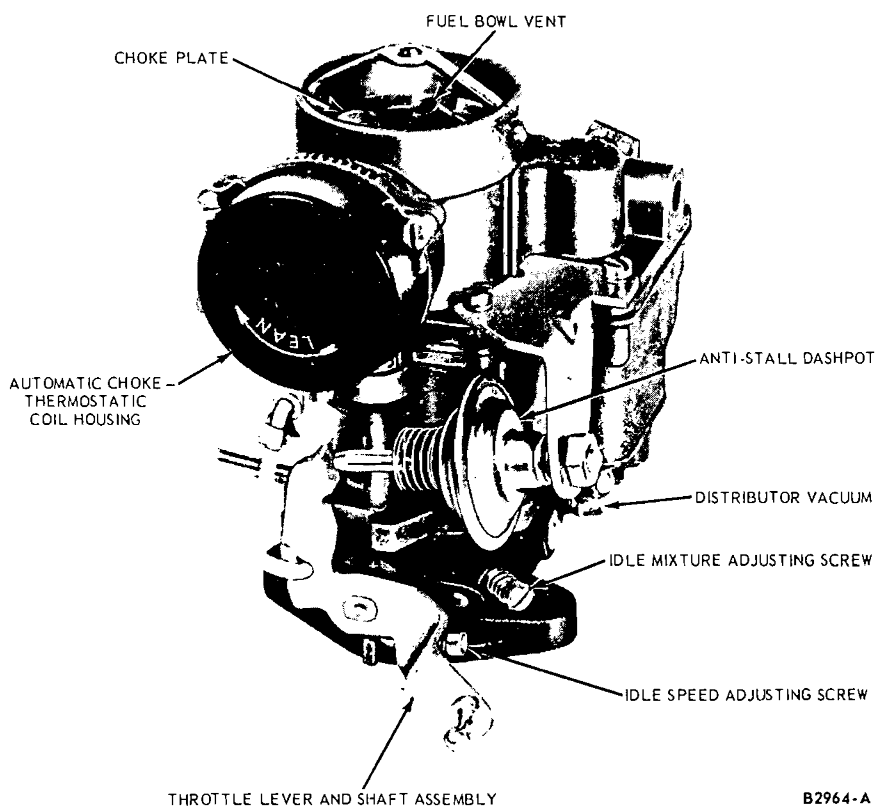


FIG. 1—Carter Model YF 1-V Carburetor — Rear View

OPERATION

The engine speed is regulated and controlled by the proportion of fuel and air delivered to the cylinders for all engine operating conditions. Operation is based on the principle of pressure differences or vacuum.

Air is drawn into the carburetor air horn by manifold vacuum. As the air passes through the carburetor on its way to enter the cylinders, low pressure is created at the fuel discharge outlets of the carburetor. The fuel bowl is vented to atmospheric and to carburetor air inlet pressure through a vent hole in the upper body assembly. The high air pressure exerted on the fuel in the bowl forces the fuel to travel up through the fuel discharge channels and out into the air stream passing through the carburetor. The fuel and air is mixed at this point and distributed into the engine cylinders for combustion.

FUEL INLET SYSTEM

The fuel inlet system (Fig. 3) of the carburetor maintains a predetermined fuel level in the fuel bowl. **The fuel level in the bowl is extremely important to carburetor calibration.** If the level of the fuel in the bowl is below the specified setting, a lean fuel-air mixture will result. A rich fuel-air mixture will occur from a higher than specified fuel level. The entire calibration of the carburetor is disturbed if the fuel level is not set as specified.

Fuel enters the fuel bowl through the fuel inlet needle valve and seat assembly. The amount of fuel entering is regulated by the distance the

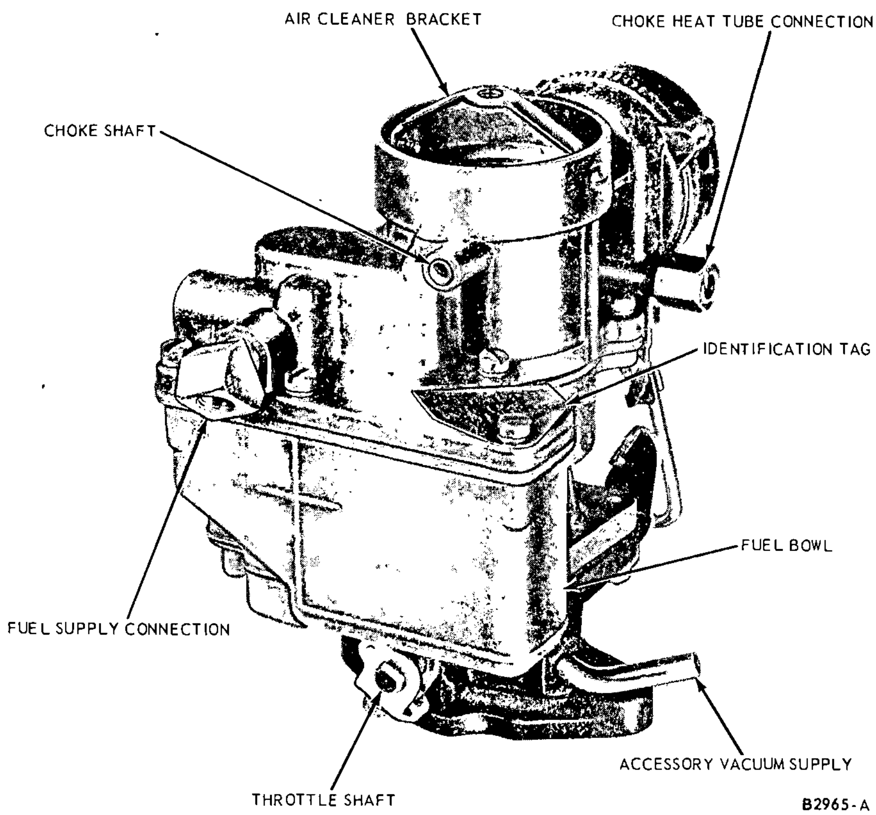


FIG. 2—Carter Model YF 1-V Carburetor — Left Front View

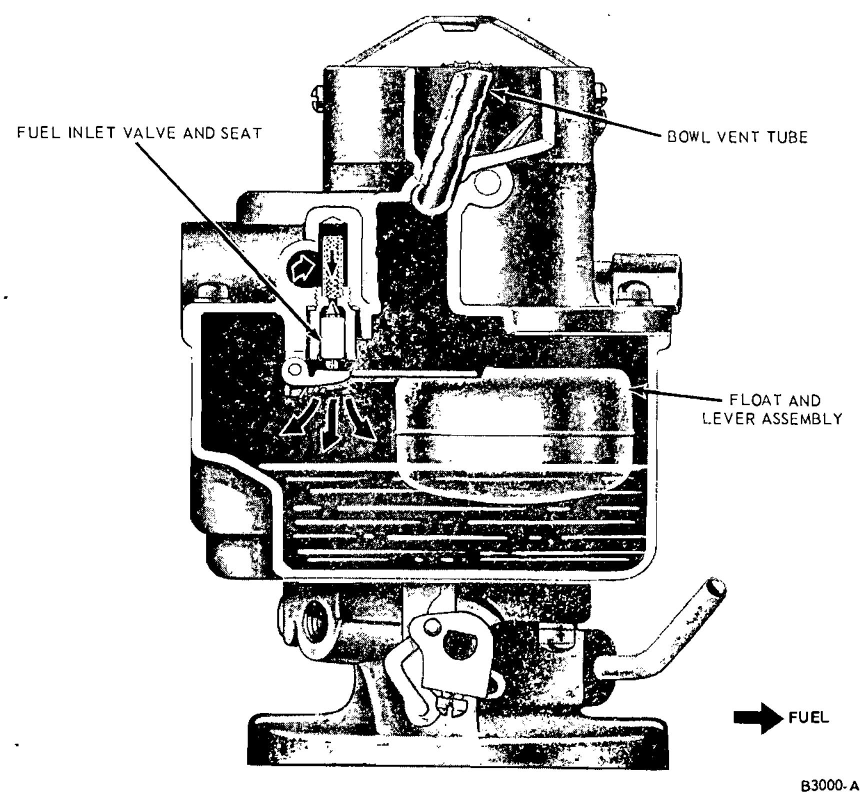


FIG. 3—Fuel Inlet System

needle valve is moved off the seat and by fuel pump pressure. **Correct fuel pump pressure is required to maintain the carburetor fuel level within the specified limits.**

The fuel level is maintained at a predetermined level by the float and lever assembly which controls the movement of the needle valve. The needle valve, riding on the tab of the float and lever assembly, reacts to any change in height of the float and the fuel level in the fuel bowl.

IDLE FUEL SYSTEM

Fuel for idle and early part throttle operation is metered through the idle, or low-speed system (Fig. 4).

Fuel enters the idle well through the metering rod jet. The low-speed jet measures the amount of fuel for idle and early part throttle operation. The air bypass, economizer and idle air bleed are carefully calibrated and serve to break up the liquid fuel. The fuel is then mixed with air as it moves through a passage to the idle port and idle adjustment screw port. Turning the idle adjustment screw inward reduces the quantity of fuel air mixture supplied by the idle circuit.

The idle port is slot-shaped. As the throttle valve is opened, more of the idle port is uncovered, allowing a greater quantity of the fuel air mixture to enter the carburetor bore.

MAIN FUEL METERING SYSTEM

The main fuel metering system (Fig. 5) supplies the fuel required for engine operation during the cruise or part-throttle range.

The position of the metering rod in the metering rod jet controls the amount of fuel admitted to the high-speed nozzle. The position of the metering rod is dual controlled; mechanically, by movement of the throttle and by manifold vacuum applied to the diaphragm.

MECHANICAL METERING ROD ACTION

During part throttle operation, manifold vacuum pulls the diaphragm assembly down holding the metering rod arm against the pump lifter link. Movement of the metering rod is then controlled by the pump lifter link, connected to the throttle shaft. This is true at all times when vacuum under the diaphragm is strong enough to overcome the tension of the pump lower diaphragm spring.

The pump upper spring serves as a bumper upon deceleration and as a delayed action spring on acceleration.

VACUUM METERING ROD ACTION

Under any operating condition, when the tension of the pump diaphragm lower spring overcomes the pull of vacuum under the diaphragm, the metering rod will move toward the wide-open throttle position.

The restriction and air bleed in the vacuum passage provide a lower and more uniform vacuum condition in the chamber below the disphragm.

ANTI-PERCOLATOR

To prevent vapor bubbles in the nozzle passage and low-speed well, caused by heat from forcing fuel out of the nozzle, anti-percolator passages and calibrated plugs or bushings are used. The purpose of the plugs and bushings is to vent the vapors and relieve the pressure before it is sufficient to force the fuel out of the nozzle and into the intake manifold. **Anti-percolator plugs, bushings, and the main nozzle are permanently installed and must not be removed in service.**

ACCELERATING PUMP SYSTEM

The accelerating pump system (Fig. 6) provides a measured amount of fuel, which is necessary for smooth engine operation during acceleration.

Accelerating pump action is controlled both mechanically and by manifold vacuum in the same manner as the metering rod. When the throttle is closed, the diaphragm moves downward and fuel is drawn into the pump fuel chamber. When the diaphragm moves downward, the discharge check is seated. When the throttle is opened, the diaphragm moves upward, forcing fuel out through the discharge passage, past the discharge check, and out of the pump jet.

If the throttle is opened suddenly, the pump upper spring will compress, resulting in a smoother pump discharge of longer duration.

Manifold vacuum is applied to the underside of the diaphragm at all times the engine is in operation. When manifold vacuum decreases to the point where the pump lower diaphragm spring overcomes the manifold vacuum, the diaphragm moves upward and a pump discharge results.

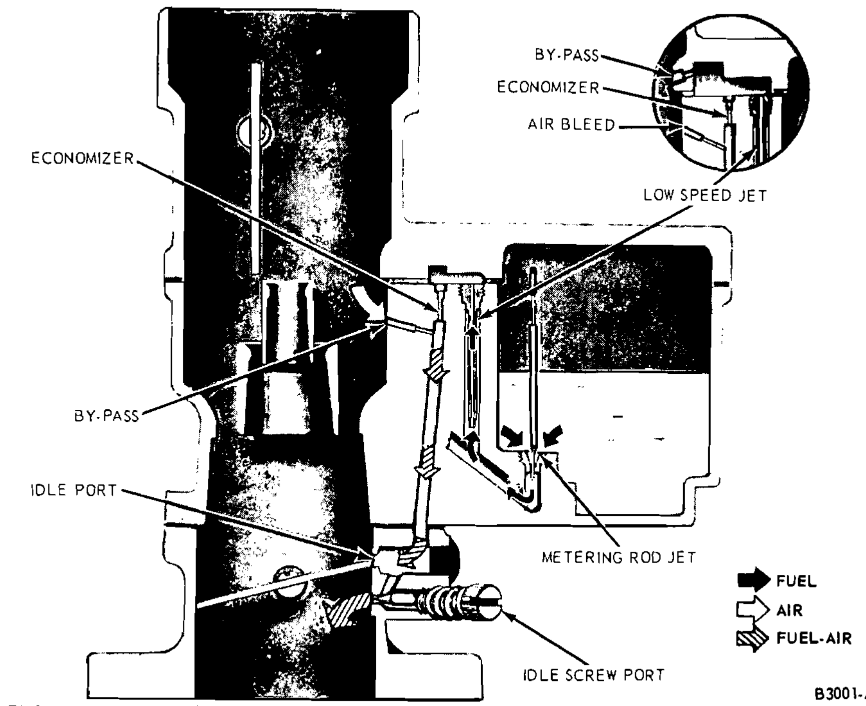


FIG. 4—Idle Fuel System

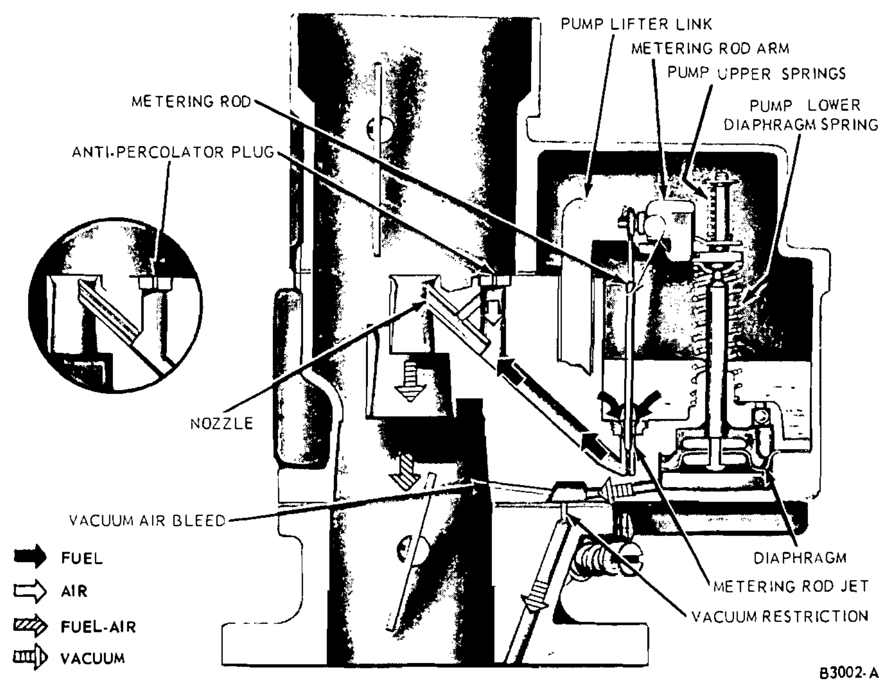


FIG. 5—Main Fuel Metering System

AUTOMATIC CHOKE SYSTEM

The automatic choke system (Fig. 7) provides a correct mixture necessary for quick, cold engine starting and warm-up.

When the engine is cold, tension of the thermostatic spring holds the choke valve closed. When the engine is started, air velocity against the offset choke valve causes the valve to open slightly against the thermostatic spring tension. Intake manifold vacuum applied to the choke piston also tends to pull the choke valve open. The choke valve assumes a position where tension of the thermostatic spring is balanced by the pull of vacuum on the piston and force of air velocity on the offset valve.

When the engine starts, slots located in the sides of the choke piston

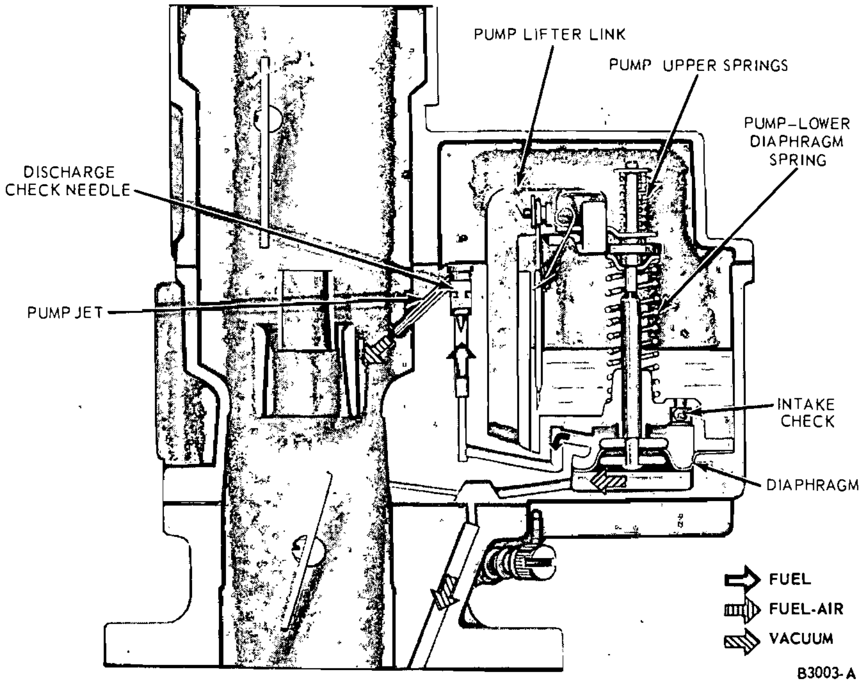


FIG. 6—Accelerating Pump System

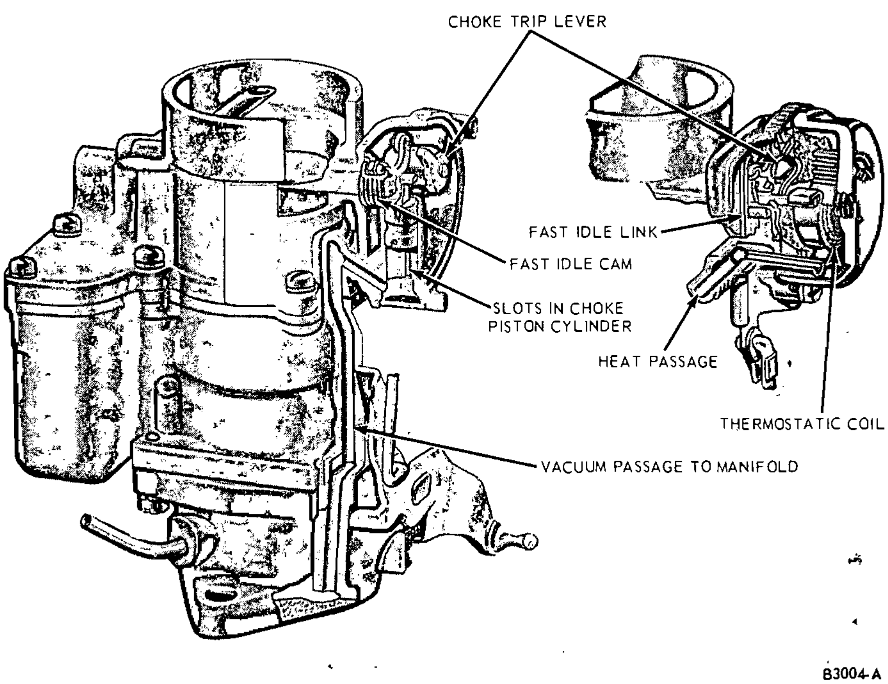


FIG. 7—Automatic Choke System

cylinder are uncovered allowing intake manifold vacuum to draw warm air, heated by the exhaust manifold, through the choke housing. The flow of warm air heats the thermostatic spring and causes it to lose some tension. The thermostatic spring loses tension gradually until the choke plate reaches full-open position.

If the engine is accelerated during the warm-up period, the corresponding drop in manifold vacuum allows the thermostatic spring to momentarily close the choke, providing a richer mixture.

During the warm-up period, it is necessary to provide a fast idle speed to prevent engine stalling. This is accomplished by a fast idle cam connected to the choke shaft. The choke-trip lever contacts the fast idle cam. The fast idle link attached to the throttle lever contacts the choke-trip lever, and prevents the throttle valve from returning to a normal warm engine idle position while the automatic choke is in operation.

If, during the starting period, the engine becomes flooded, the choke valve may be opened manually to clean out any excessive fuel in the intake manifold. This may be accomplished by depressing the accelerator pedal to the floor and engaging the starter. The unloader projection on the fast idle link will contact the unloader lug on the choke-trip lever and in turn partially open the choke valve.

2 REMOVAL AND INSTALLATION

REMOVAL

1. Remove the air cleaner. Disconnect the distributor vacuum line from the carburetor and the automatic transmission or accessory vacuum line if so equipped. Disconnect the automatic choke heat tube at the thermostatic coil (choke) housing on the carburetor. Disconnect the fuel line at the carburetor. Disconnect the accelerator linkage at the carburetor throttle shaft and lever assembly.

2. Remove the two nuts retaining the carburetor to the carburetor adapter. **Pull the carburetor straight up and off the adapter to prevent damage to the throttle plate.**

INSTALLATION

1. Clean all old gasket material from the carburetor throttle body flange and the carburetor adapter surface. Install a new carburetor to adapter gasket. Set the carburetor straight down on the adapter studs. Install the two retaining nuts and tighten evenly.

2. Connect the accelerator linkage to the carburetor throttle lever. Connect the fuel line to the carburetor. Install the automatic choke heat tube to the thermostatic coil housing and tighten the tube nut. Connect the distributor and automatic transmission or accessory vacuum lines to the carburetor. Set the thermostatic coil housing index mark to specification.

3. Start the engine and check for fuel or vacuum leaks. Allow the engine to reach normal operating temperature. Set the idle mixture and idle speed. Check and set the anti-stall clearance. Install the air cleaner, and reset the idle speed and mixture as necessary.

3 MAJOR REPAIR OPERATIONS

DISASSEMBLY

Use a separate container for the component parts of the various assemblies to facilitate cleaning, inspection and assembly.

The following is a step-by-step sequence of operations for completely overhauling the carburetor; however, certain components of the carburetor may be serviced without a complete disassembly of the entire unit.

A disassembled view of the carburetor is shown in Fig. 1.

1. Disengage the throttle connector rod retainer (Fig. 11) from the choke connector rod, and pull the rod out of the fast idle link.

2. Remove the attaching screws and retainers, the thermostatic spring housing assembly, spring housing gasket, spring housing baffle plate, choke trip lever and pin assembly, and fast idle link.

3. Remove the air horn assembly attaching screws, dashpot and bracket assembly, air horn assembly, and air horn gasket.

4. Hold the air horn assembly bottom side up, and remove the float pin and float and lever assembly. Turn the air horn assembly over and allow the needle pin, spring, needle, and seat to fall into the hand.

5. Remove the needle seat and gasket.

6. Remove the choke plate attaching screws. File the staked ends, if necessary, and use new screws upon reassembly. Remove the choke plate from the air horn assembly. Disengage the fast idle cam spring from the cam spring lever on the choke piston lever and shaft assembly. Rotate the choke shaft and piston assembly counterclockwise until the choke piston is out of the choke piston cylinder (Fig. 8). Remove the assembly from the air horn. Remove the piston pin, piston, fast idle cam, and fast idle cam spring from the choke piston lever and shaft assembly.

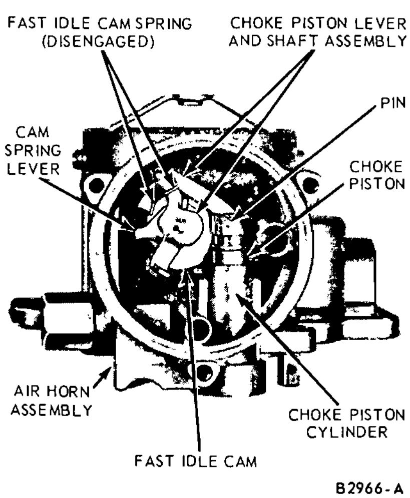


FIG. 8—Automatic Choke Piston Removal or Installation

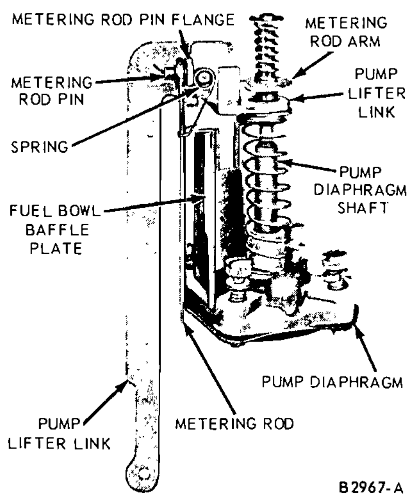


FIG. 9—Acceleration Pump and Lifter Link Assembly

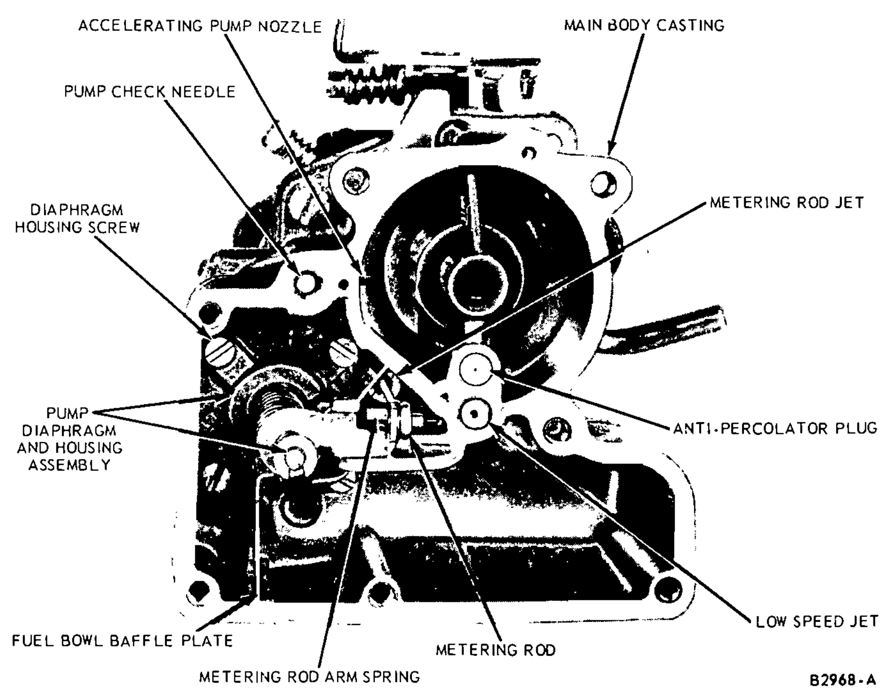


FIG. 10—Pump Diaphragm and Housing Installation

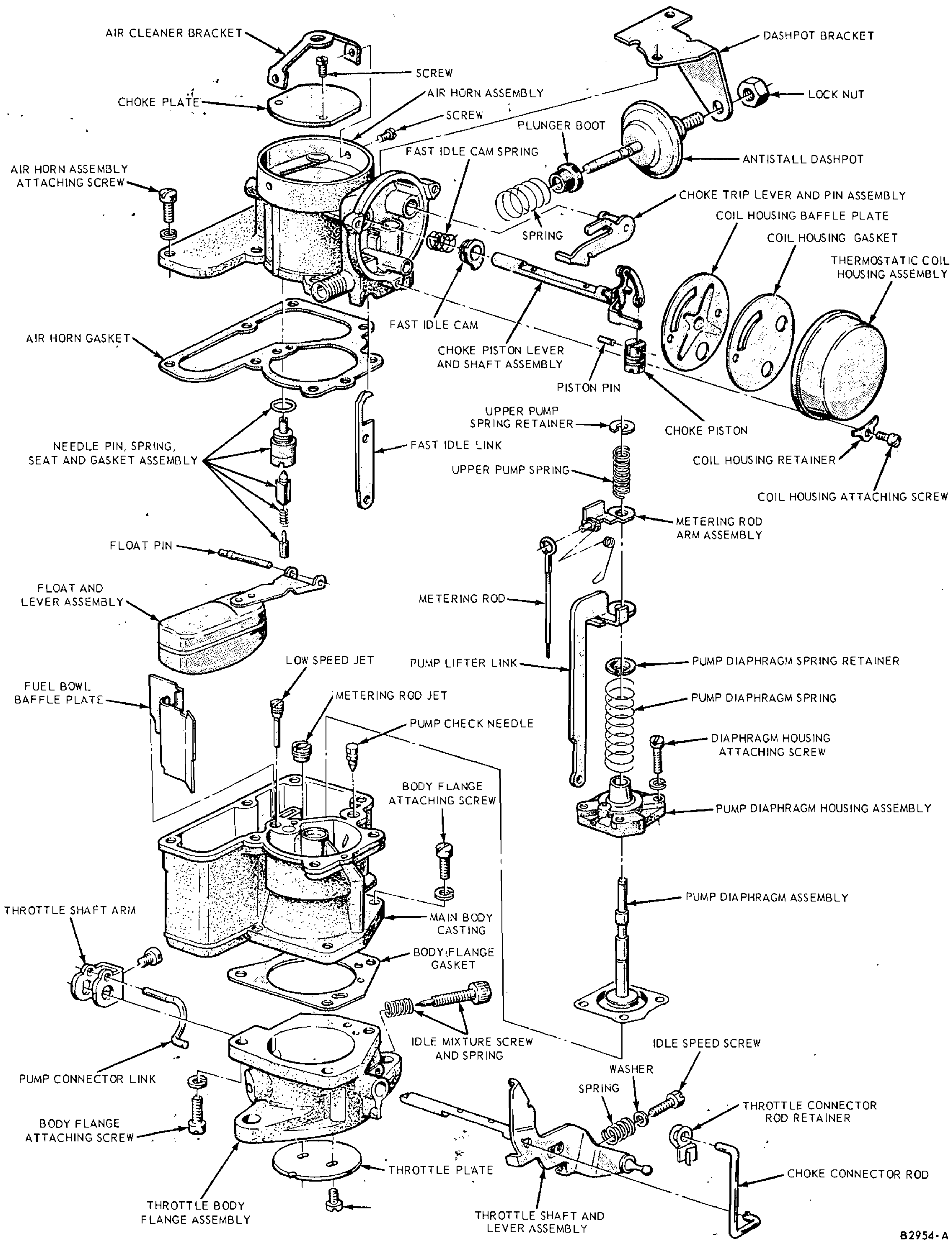


FIG. 11—Carter Model YF Carburetor Assembly

7. Turn the main body casting upside down and catch the accelerating pump check needle in your hand.

8. Loosen the throttle shaft arm screw, and remove the arm and the pump connector link.

9. Remove the accelerating pump diaphragm housing screws. Lift out the pump diaphragm assembly, the pump lifter link, the metering rod and the fuel bowl baffle plate as a unit (Fig. 9).

10. Disengage the metering rod arm spring from the metering rod, and remove the metering rod from the metering rod arm assembly. Compress the upper pump spring, and remove the spring retainer. Remove the upper spring, the metering rod arm assembly, and the pump lifter link from the pump diaphragm shaft. Compress the pump diaphragm spring, and remove the pump diaphragm spring retainer, spring, and pump diaphragm assembly from the pump diaphragm housing assembly.

11. **With the proper size jet tool or screwdriver** remove the low speed jet (Fig. 10).

12. Remove the retaining screws and separate the throttle body flange assembly from the main body casting. Remove the body flange gasket.

13. Remove the idle mixture screw and spring. Remove the throttle plate retaining screws. File the staked ends, if necessary, and use new screws upon reassembly. Slide the throttle shaft and lever assembly out of the throttle body flange assembly.

CLEANING AND INSPECTION

Clean and inspect the carburetor component parts. Refer to Part 10-1, Section 3, for the proper procedure. Replace all worn or damaged parts.

ASSEMBLY

1. Install the throttle shaft and lever assembly (Fig. 11) in the throttle body flange. Position the throttle plate on the throttle shaft with the notch in the plate aligned with the slotted idle port (Fig. 12) in the throttle body flange. Install the throttle plate attaching screws snug, but not tight. Move the shaft back and forth and rotate it to be sure the throttle plate does not bind in the flange bore. Reposition the plate if necessary. Tighten the screws and stake (or peen) the screws in place.

2. Install the idle mixture screw and spring. Lightly seat the screw. Then back it out (unscrew) 1-1/4 turns for initial setting.

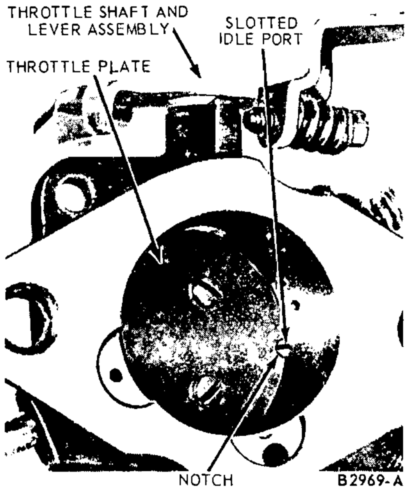


FIG. 12—Throttle Plate Installation

3. Place a new body flange gasket and the main body casting on the throttle body flange. Install the attaching screws and tighten them evenly.

4. With the proper size jet tool (or screwdriver) install the low speed jet and the metering rod jet (Fig. 10).

5. Install the pump diaphragm in the pump diaphragm housing (Fig. 11). Position the pump diaphragm spring on the diaphragm shaft and housing assembly. Install the spring retainer. Install the pump lifter link, metering rod arm and spring assembly, and upper pump spring on the diaphragm shaft. Depress the spring and install the upper pump spring retainer.

6. Install the metering rod on the metering rod arm and place the looped end of the metering rod arm spring on the metering rod as shown in Fig. 9. Align the pump diaphragm with the diaphragm housing; make sure the holes are aligned. Install the housing attaching screws to keep the diaphragm and housing aligned.

7. Position the fuel bowl baffle plate on the pump assembly as shown in Illus. Figs. 9 and 10. Align the pump housing, pump lifter link, metering rod and baffle plate with the main body casting. **Be sure the vacuum passage in the diaphragm housing is aligned with the vacuum passage in the main body.** Install the assembly in the main body casting, being careful to engage the pump lifter link with the main body, the baffle plate with the grooves in the main body, and to insert the metering rod in the metering rod jet. Install the pump housing attaching screws snug, but not tight. Push down on the diaphragm shaft to compress the diaphragm, and tighten the attaching screws. Adjust the metering rod, following the procedure under Metering Rod Adjustment.

8. Install the throttle shaft arm and pump connector link on the throttle shaft and pump lifter link (Fig. 13). Tighten the lock screw.

9. Install the fast idle cam and spring on the choke piston lever and shaft assembly. Assemble the choke piston and pin to the choke piston lever and shaft assembly. Disengage the cam spring from the cam spring lever on the choke lever and shaft assembly. Install the choke shaft assembly in the air horn and position the piston as shown in Fig. 8.

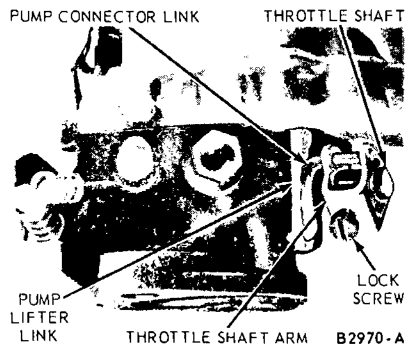


FIG. 13—Throttle Shaft Arm Installation

10. Align the piston with the cylinder and rotate the shaft assembly clockwise until the piston pin is inside the piston cylinder. Position the cam spring on the cam spring lever of the choke lever assembly. **When the spring is properly positioned, the tangs on the cam and the choke lever will be aligned one in front of the other.**

11. Position the choke plate on the choke shaft and install the screws snug. Check the choke plate movement to be sure it isn't binding. Tighten the screws and peen or stake them to prevent loosening.

12. Install the needle seat and gasket in the air horn. With the air horn inverted, install the needle, pin spring, needle pin, float and lever assembly, and float pin.

13. Adjust the float level to specifications.

14. Place the pump check needle in the main body casting (Fig. 10). Position a new air horn gasket, the air horn assembly, and the anti-stall dashpot and bracket on the main body. Install and tighten the attaching screws.

15. Install the choke trip lever and fast idle link in the choke housing of the air horn. Be sure they are properly engaged with each other and with the

choke piston lever and shaft assembly. Install the thermostatic coil housing, gasket and baffle plate with the gasket between the baffle and coil housing. Be sure the thermostatic spring engages the choke lever tang. Install the retainers and housing screws. Set the coil housing index to specifications and tighten the screws.

16. Install the throttle connector rod retainer on the fast idle link. Install the choke connector rod on the throttle lever and fast idle link. Engage the connector rod retainer with the choke connector rod.

PART 10-4—*Autolite Model 2100 2-V Carburetor*

1 DESCRIPTION AND OPERATION

DESCRIPTION

The carburetor (Figs. 1 and 2) has two main assemblies, the air horn and the main body.

The air horn assembly, which serves as the main body cover, contains the choke plate and the vents for the fuel bowl.

The throttle plate, the accelerating pump assembly, the power valve assembly, and the fuel bowl are in the main body. The automatic choke housing is attached to the main body.

The two barrels each contain a main and booster venturi, main fuel discharge, accelerating pump discharge, idle fuel discharge and a throttle plate.

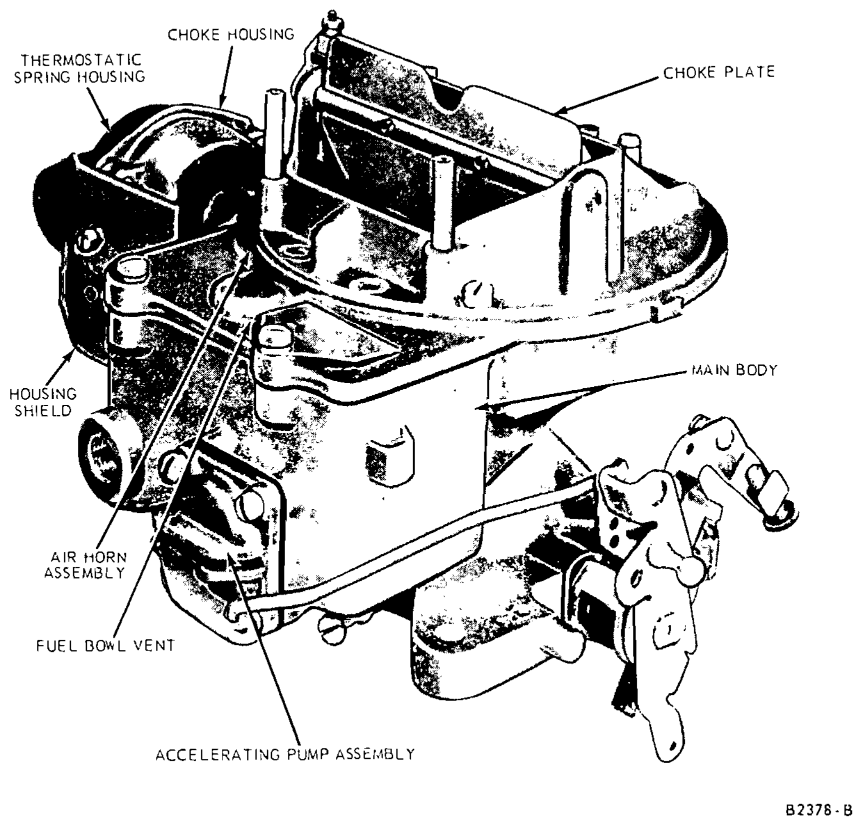


FIG. 1—Autolite Model 2100 2-V Carburetor Left Front 3/4 View

OPERATION

FUEL INLET SYSTEM

The amount of fuel entering the fuel bowl (Fig. 3) is regulated by the distance the fuel inlet needle is raised off its seat and by fuel pump pressure. Movement of the fuel inlet needle in relation to the seat is controlled by the float and lever assembly which rises and falls with the fuel level. When the fuel in the fuel bowl reaches a pre-set level, the float lowers the fuel inlet needle to a position where it restricts the flow of fuel, admitting only enough fuel to replace that being used.

An integral retaining clip is attached to the fuel inlet needle assembly. The clip hooks over the tab on the end of the lever of the float assembly. This clip assures reaction of the fuel inlet needle to any downward movement of the float. Downward movement of the float or float drop is controlled by adjustment of the tab end of the float lever.

A wire-type retainer prevents movement of the float shaft within the guides on each side of the fuel bowl. The retainer fits into a groove on the outside of the fuel inlet needle seat. The ends of the retainer are hooked over grooves on opposite ends of the float shaft.

FUEL BOWL VENT SYSTEM

Percolation or fuel vapors may form in the fuel bowl when a hot engine is stopped, idling or operating at very low speeds. Engine performance is improved by venting the fuel bowl to the atmosphere (Fig. 1).

The fuel bowl is internally vented into the air cleaner. On some engine applications, it is also externally vented to the atmosphere.

The fuel bowl vent rod, plug and spring assembly is mounted within a bracket retained on the accelerator pump cover by two screws.

At normal or wide-open throttle operation, vent rod spring pressure, applied through the vent rod to the plug,

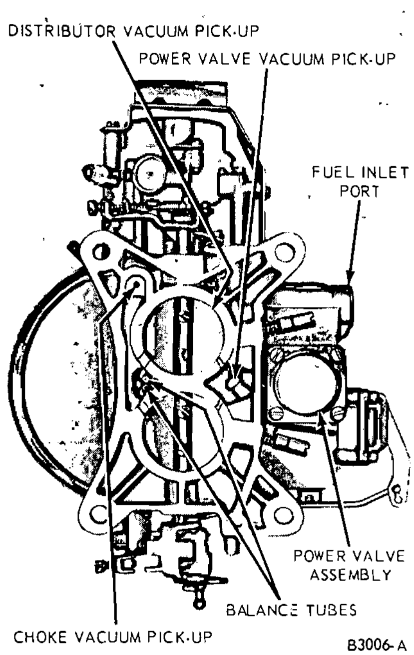


FIG. 2—Autolite Model 2100 2-V Carburetor—Bottom View

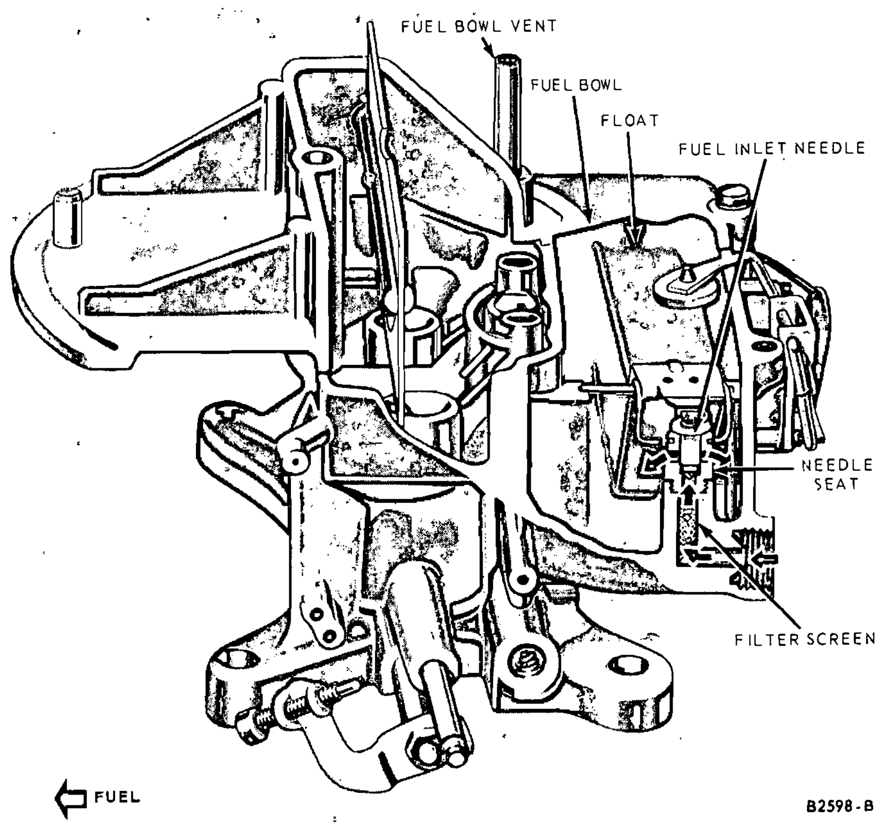


FIG. 3—Fuel Inlet System

seals the fuel bowl vent opening in the air horn.

During closed or part-throttle operation, the accelerator pump lever overcomes spring pressure against the vent rod and the inward movement of the vent rod opens the vent plug a specified distance from the air horn at the fuel bowl vent opening.

AUTOMATIC CHOKE SYSTEM

The choke plate, located in the air horn above the barrels, when closed, provides a high vacuum above as well as below the throttle plates. With a vacuum above the throttle plates, fuel will flow from the main fuel system as well as from the idle fuel system. This provides the extremely rich fuel mixture necessary for cold engine operation.

The carburetor choke shaft is linked to a thermostatic choke control mechanism mounted on the main body (Fig. 4).

The linkage between the choke lever and the throttle shaft is designed so that the choke plate will partially open when the accelerator pedal is fully depressed. This permits unloading of a flooded engine.

The automatic choke is equipped with a bi-metal thermostatic spring and a vacuum piston (Fig. 4). The bimetal thermostatic spring mechanism winds up when cold and unwinds when warm. When the engine is cold, the thermostatic spring, through attaching linkage, holds the choke piston upward and the choke plate in a closed position prior to engine start. Manifold vacuum channeled through a passage in the choke control housing draws the choke vacuum piston downward, exerting an opening force on the choke plate.

When the engine is started, manifold vacuum, acting directly on the piston located in the choke housing, immediately moves the choke plate against the tension of the thermostatic spring to a partially open position to prevent stalling.

As the engine continues to operate, manifold vacuum draws heated air from the exhaust manifold heat chamber. The amount of air entering the choke housing is controlled by restrictions in the air passages in the carburetor.

The warmed air enters the choke housing and heats the thermostatic spring, causing it to unwind. The tension of the thermostatic spring gradually decreases as the temperature of the air from the heat chamber rises, allowing the choke plate to open. The air is exhausted into the intake manifold.

When the engine reaches its normal operating temperature, the thermostatic spring exerts tension on the choke plate forcing it to the full open position. In this position, the choke piston is at its lowest point in the cylinder. Slots in the piston chamber wall allow sufficient air to bleed past the piston and into the intake manifold, causing a continual flow of warm air to pass through the thermostatic spring housing. The spring remains heated and the choke plate remains fully open until the engine is stopped and allowed to cool.

The choke rod actuates the fast idle cam during choking. Steps on the edge of the fast idle cam contact the fast idle adjusting screw. This permits a faster engine idle speed for smoother running when the engine is cold. As the choke plate is moved through its range of travel from the closed to the open position, the choke rod rotates the fast idle cam. Each step on the fast idle cam permits a slower idle rpm as engine temperature rises and choking is reduced.

During the warm-up period, if the engine should reach the stall point due to a lean mixture, manifold vacuum will drop considerably. The tension of the thermostatic spring then overcomes the lowered vacuum acting on the choke piston and the choke plate is moved toward the closed position, providing a richer mixture to help prevent stalling.

The linkage between the choke lever and the throttle shaft is designed so that the choke plate will

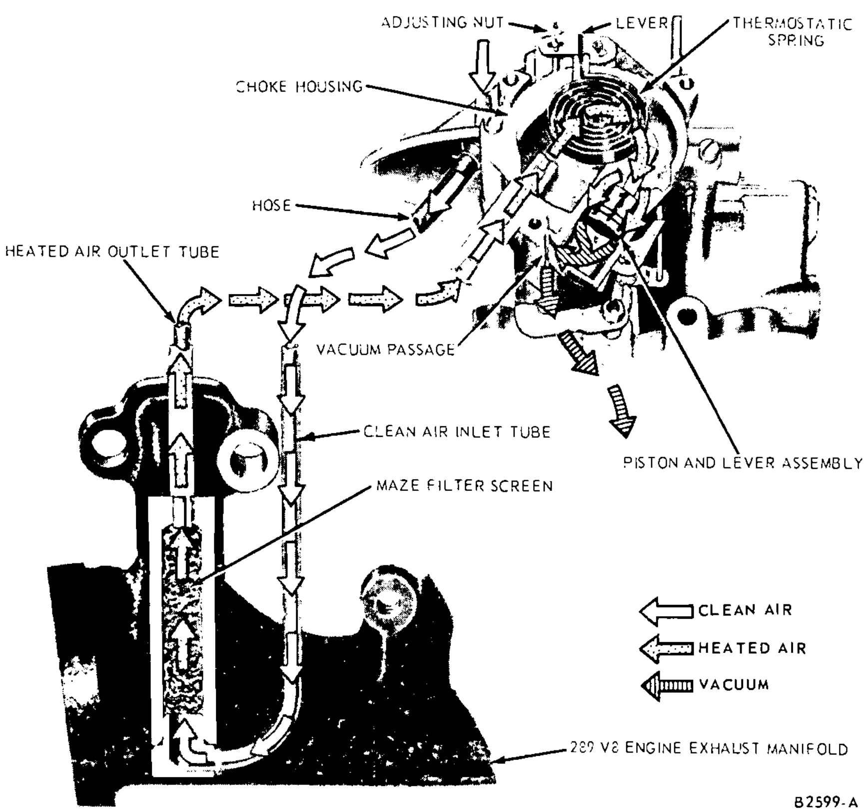


FIG. 4—Automatic Choke System

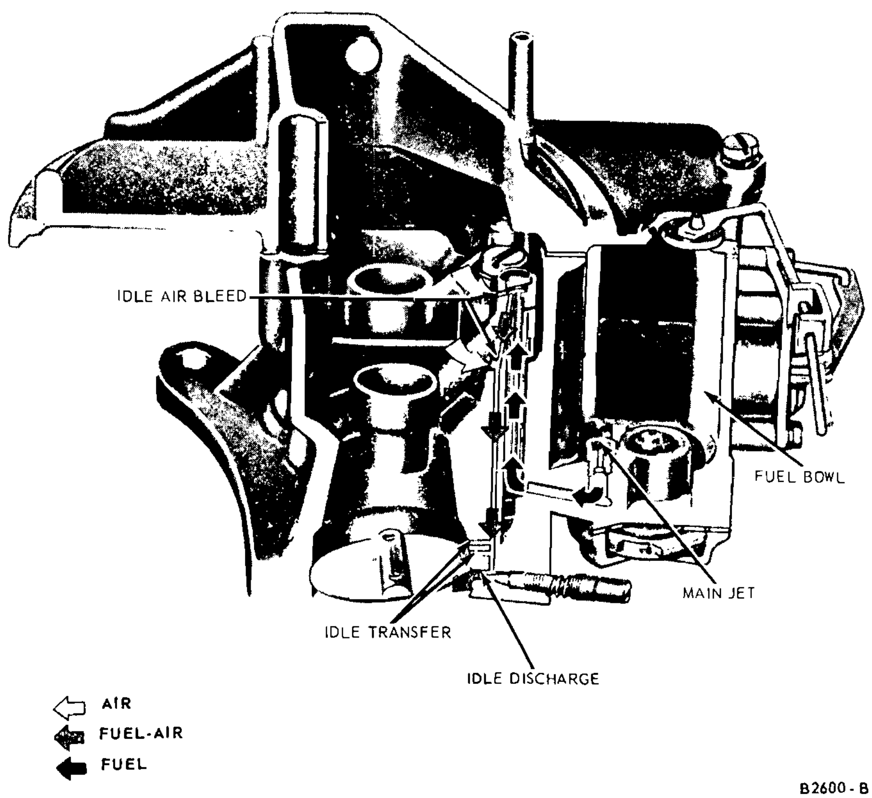


FIG. 5—Idle Fuel System

partially open when the accelerator pedal is fully depressed. This permits unloading of a flooded engine.

IDLE FUEL SYSTEM

The difference in pressure between the fuel bowl and the idle discharge port forces fuel through the idle fuel system. Fuel flows from the fuel bowl through the main jet and into the bottom of the main well (Fig. 5).

From the main well, the fuel flows up through the idle tube and through a short diagonal passage in the booster venturi assembly into the idle passage in the main body. A calibrated restriction, at the upper tip of the idle tube, meters the flow of fuel.

Air enters the idle system from the air bleed, located directly above the idle tube. The air bleed also acts as a vent to prevent siphoning at off idle or high speeds and when the engine is stopped.

Fuel flows down the idle passage in the main body past three idle transfer holes. The idle transfer holes act as additional air bleeds at curb idle. The Fuel then flows past the pointed tip of the adjusting needle which controls the idle fuel discharge. From the adjusting needle chamber, the fuel flows through a short horizontal passage and is discharged below the throttle plates.

During off idle when the throttle plate is moved slightly past the idle transfer holes, each hole begins discharging fuel as it is exposed to manifold vacuum. As the throttle plate is opened still wider and engine speed increases, the air flow through the carburetor is also increased. This creates a vacuum in the booster venturi strong enough to bring the main fuel system into operation. Fuel flow from the idle fuel system tapers off as the main fuel system begins discharging fuel.

ACCELERATING SYSTEM

Upon acceleration, the air flow through the carburetor responds almost immediately to the increased throttle opening. There is, however, a brief interval before the flowing fuel, which is heavier than air, can gain the required flow speed to maintain the desired balance of fuel and air. During this interval, the accelerating system (Fig. 6) supplies fuel until the other systems can once again provide the proper mixture.

When the throttle is closed, the diaphragm return spring forces the diaphragm toward the cover, drawing fuel into the chamber through

the inlet. The inlet has an Elastomer valve which uncovers the inlet hole to admit fuel from the fuel bowl. The valve covers the inlet hole when the accelerating pump is operated to prevent the fuel from returning to the bowl. A discharge weight and ball check prevents air from entering from the discharge nozzle when fuel is drawn into the diaphragm chamber.

When the throttle is opened, the diaphragm rod is forced inward, forcing fuel from the chamber into the discharge passage. Fuel under pressure forces the pump discharge weight and ball off their seat and fuel passes through the accelerating pump discharge screw and is sprayed into each main venturi through discharge ports.

An air bleed in the wall of the accelerating pump fuel chamber prevents vapor entrapment and pressure build-up in the diaphragm chamber.

MAIN FUEL SYSTEM

As engine speed increases, the air passing through the booster venturi creates a vacuum. The amount of vacuum is determined by the air flow through the venturi, which in turn is regulated by the speed of the engine. The difference in pressure between the main discharge port and the fuel bowl causes fuel to flow through the main fuel system (Fig. 7).

At a predetermined venturi vacuum, fuel flows from the fuel bowl, through the main jets, and into the bottom of the main well. The fuel moves up the main well tube past air bleed holes. Filtered air from the main air bleed enters the fuel flow in the main well tube through holes in the side of the tube. The main air bleed meters an increasing amount of air to the fuel as venturi vacuum increases, maintaining the required fuel-air ratio. The mixture of fuel and air is lighter than raw fuel and responds faster to changes in venturi vacuum. It also atomizes more readily than raw fuel. The fuel is discharged into the booster venturi where it is atomized and mixed with the air flowing through the carburetor.

The throttle plate controls the amount of the fuel-air mixture admitted to the intake manifold, regulating the speed and power output of the engine.

A balance tube is located in each barrel directly below the booster venturi. When decelerating, the balance tube siphons off any excess fuel droplets remaining around the edge of the booster venturi and discharges

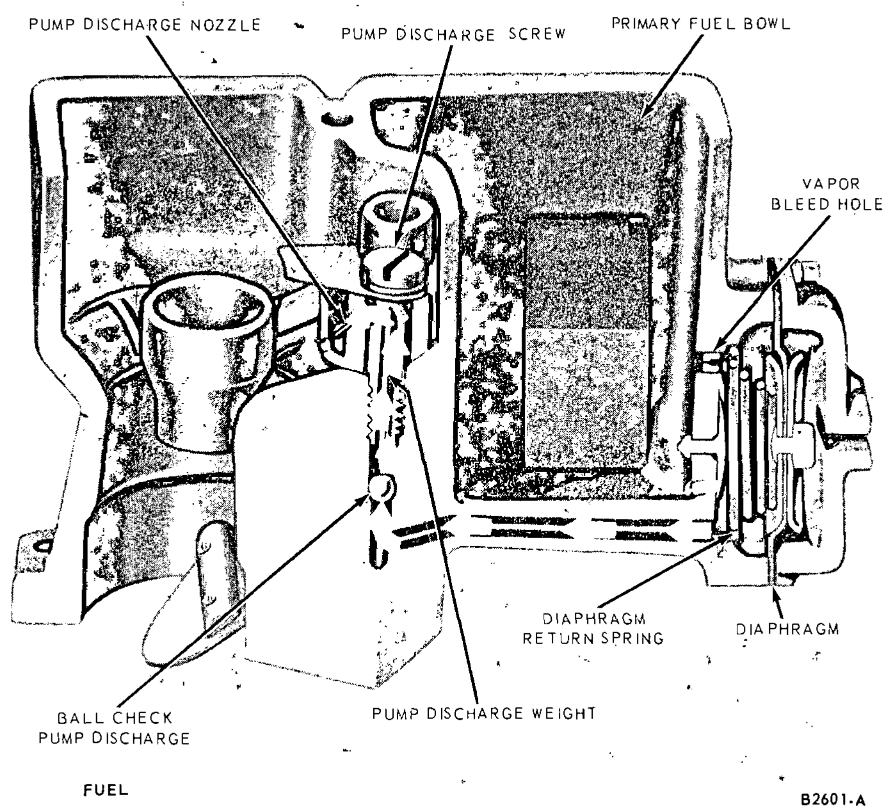


FIG. 6—Accelerating Pump System

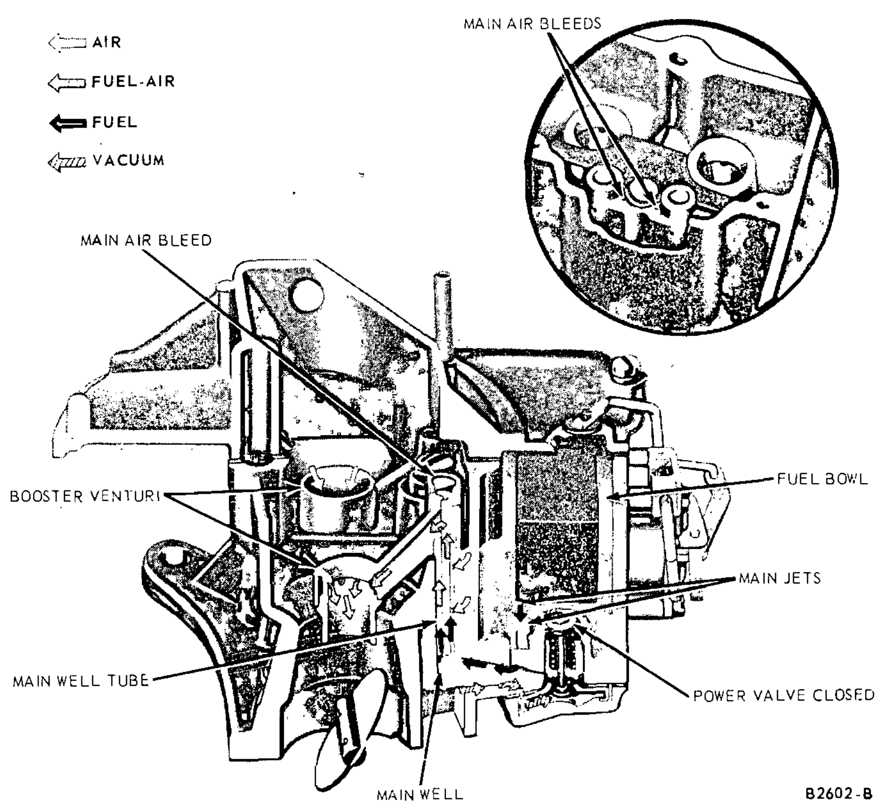


FIG. 7—Main Fuel System

the droplets into the equalizing slots in the base of the carburetor where they are mixed with the idle fuel. The balance tube also acts as an additional air bleed during the idle fuel system operation.

POWER FUEL SYSTEM

During periods of increased road loads or high speed operation, the fuel-air ratio must be increased for added power. The added fuel required during this period is supplied by the power fuel system (Fig. 8).

The power fuel system is controlled by the intake manifold vacuum.

Manifold vacuum is transmitted from an opening in the base of the main body, through a passage in the main body and power valve chamber to the power valve diaphragm. The manifold vacuum, acting on the power valve at idle speed or normal road load conditions, is great enough to hold the power valve diaphragm down, overcoming the tension of the spring on the valve stem and holding the valve closed. When high power operation places a greater load on the engine and manifold vacuum drops below a predetermined value, the spring opens the power valve. Fuel from the fuel bowl flows through the power valve and into passages leading to the main fuel well. Here the fuel is added to the fuel from the main fuel system, enriching the mixture.

As engine power demands are reduced, manifold vacuum increases. The increased vacuum overcomes the tension of the valve stem spring and closes the power valve.

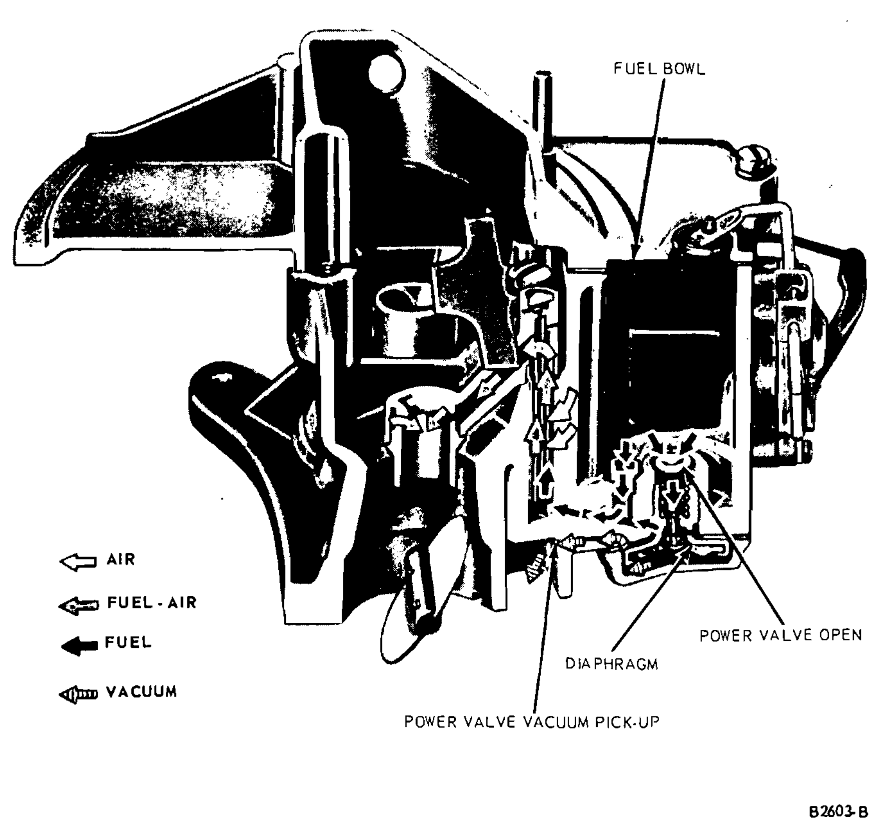


FIG. 8—Power Fuel System

2 REMOVAL AND INSTALLATION

REMOVAL

Flooding, stumble on acceleration and other performance complaints are in many instances, caused by the presence of dirt, water or other foreign matter in the carburetor. To aid in diagnosing the cause of complaint, the carburetor should be carefully removed from the engine without removing the fuel from the bowls. The contents of the bowls may then be examined for contamination as the carburetor is disassembled.

1. Remove the air cleaner (Part 10-8, Section 2). Remove the choke shield retaining screws and remove the hose and shield from the carburetor assembly.
2. Remove the throttle cable from the throttle lever. Disconnect the distributor vacuum line (if so equipped), in-line fuel filter and the choke heat tube at the carburetor.
3. Disconnect the choke clean air tube from the air horn.
4. Remove the carburetor retaining nuts and lockwashers; then remove the carburetor. Remove the carburetor mounting gasket, spacer and lower gasket from the intake manifold.

INSTALLATION

1. Clean the gasket mounting surfaces of the spacer and carburetor. Place the spacer between two new gaskets and position the spacer and gaskets on the intake manifold. Position the carburetor on the spacer and gasket and secure it with the retaining lockwashers and nuts. To prevent leakage, distortion or damage to the carburetor body flange, snug the nuts; then, alternately tighten each nut in a criss-cross pattern to the specified torque (Part 10-11).
2. Connect the in-line fuel filter throttle cable, choke heat tube, and distributor vacuum line (if so equipped). Position the heater hose on the choke shield and install the shield and retaining screws.
3. Connect the choke clean air tube to the air horn.
4. Refer to Part 10-1, Section 2, Common Adjustments and Repairs and adjust the engine idle speed, the idle fuel mixture, anti-stall dashpot (if so equipped) and the accelerating pump stroke (if required). Install the air cleaner (Part 10-8, Section 2).

3 MAJOR REPAIR OPERATIONS

DISASSEMBLY

To facilitate working on the carburetor, and to prevent damage to the throttle plates, install carburetor legs on the base. If legs are unavailable, install 4 bolts (about 2 1/4 inches long of the correct diameter) and 8 nuts on the carburetor base.

Use a separate container for the component parts of the various assemblies to facilitate cleaning, inspection and assembly.

The following is a step-by-step sequence of operations for completely overhauling the carburetor. However, certain components of the carburetor may be serviced without a complete disassembly of the entire unit. For a complete carburetor overhaul, follow all of the steps. To partially overhaul a carburetor or to install a new gasket kit, follow only the applicable steps.

Refer to Fig. 20 for parts identification.

AIR HORN

1. Remove the air cleaner anchor screw.

2. Remove the automatic choke control rod retainer.

3. Remove the air horn retaining screws, lock washers and the carburetor identification tag. Remove the air horn and air horn gasket (Fig. 9).

4. Remove the choke control rod by loosening and turning the choke shaft lever clevis nut counterclockwise. Remove the rod from the air horn. Slide the felt seal and two washers out of the air horn.

If it is necessary to remove the choke plate, remove the staking marks on the choke plate retaining screws and remove the screws. Remove the choke plate by sliding it out of the shaft from the top of the air horn. Slide the choke shaft out of the air horn.

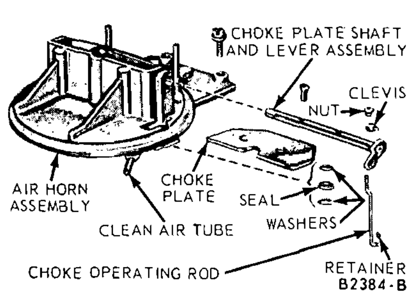


FIG. 9—Air Horn Assembly

If the tips of the screws are flared excessively, file off the flared portion to prevent damage to the threads in the shaft.

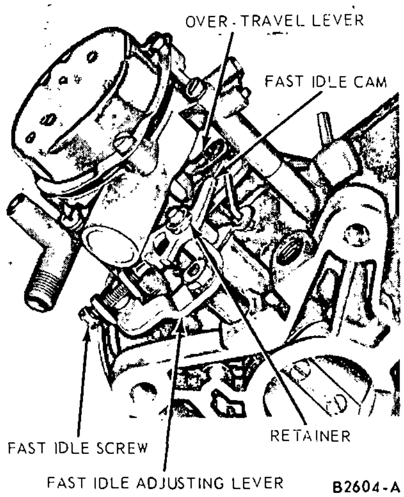


FIG. 10—Fast Idle Cam and Fast Idle Lever

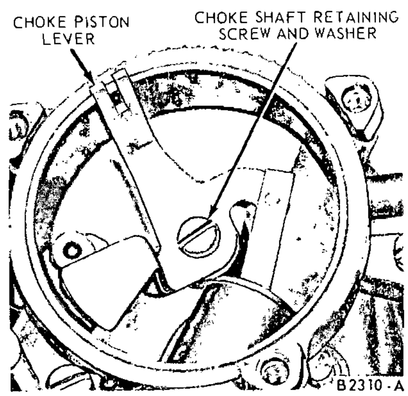


FIG. 11—Choke Shaft and Lever

VACUUM PISTON CHOKE

1. Remove the fast idle cam retainer (Fig. 10).

2. Remove the thermostatic choke spring housing retaining screws and remove the clamp, housing and gasket.

3. Remove the choke housing assembly retaining screws. If the air horn was not previously removed, remove the choke control rod retainer. Remove the choke housing assembly, gasket and the fast idle cam. Remove the fast idle cam and rod from the fast idle cam lever.

4. Remove the choke lever retaining screw and washer (Fig. 11). Remove the choke piston lever from the housing. If necessary, remove the pin securing the choke piston to the choke lever link. Remove the choke lever and fast idle cam lever from the choke housing.

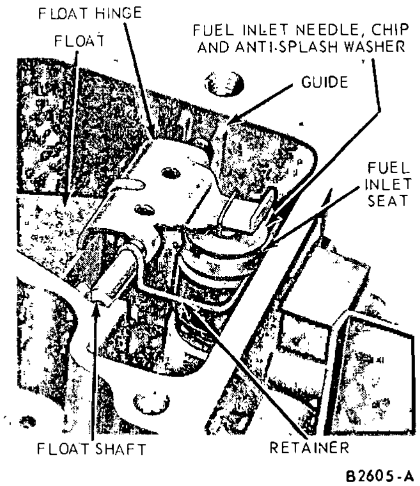


FIG. 12—Float Assembly

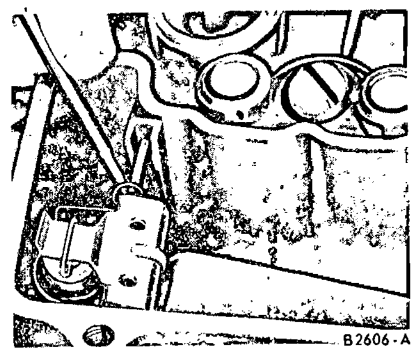


FIG. 13—Float Shaft Retainer Removal or Installation

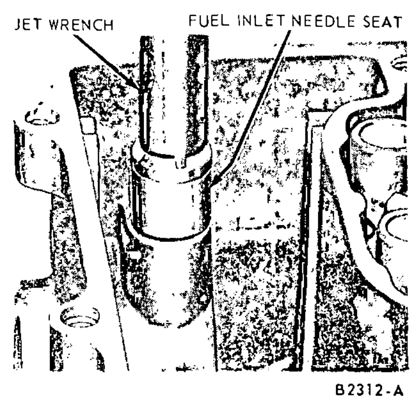


FIG. 14—Fuel Inlet Needle Seat Removal or Installation

MAIN BODY

1. With the use of a screwdriver,

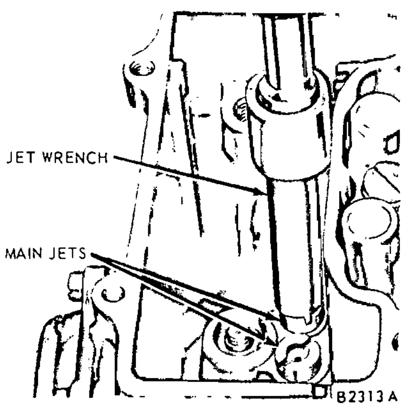


FIG. 15—Main Jet Removal or Installation

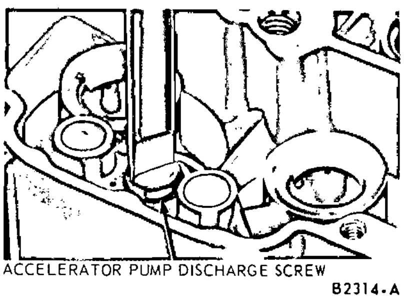


FIG. 16—Booster Venturi Removal or Installation

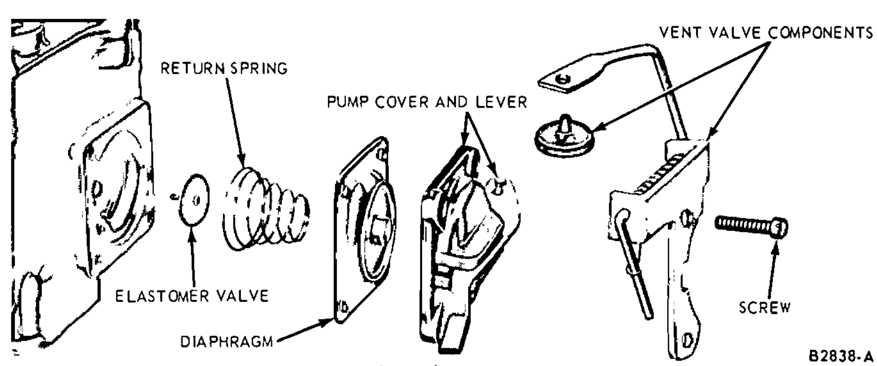


FIG. 17—Accelerating Pump and Fuel Bowl Vent Valve Assembly

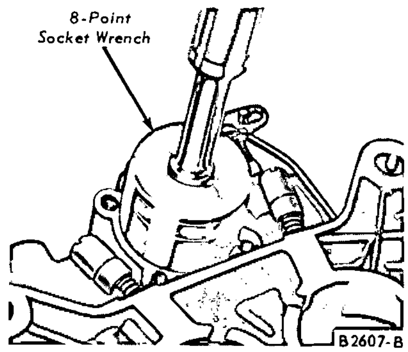


FIG. 18—Power Valve Removal or Installation

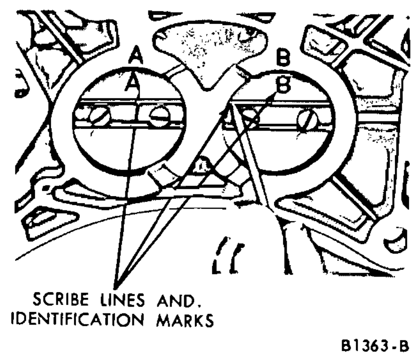


FIG. 19—Throttle Plate Removal

pry the float shaft retainer from the fuel inlet seat (Figs. 12 and 13). Remove the float, float shaft retainer and fuel inlet needle assembly. Remove the retainer and float shaft from the float lever.

2. Remove the fuel inlet needle, seat, filter screen, and the main jets with a jet wrench (Figs. 14 and 15).

3. Remove the accelerator pump discharge screw, air distribution plate (if so equipped), booster venturi and gasket (Fig. 16). Invert the main body and let the accelerating pump discharge weight and ball fall into the hand. Remove the fuel inlet fitting.

4. Remove the accelerator pump operating rod from the over-travel lever and the retainer. **To release the operating rod from the over-travel lever retainer, press the ends of the retainer together; then, at the same time, press the rod away from the retainer until it is disengaged.** Remove the rod and retainer.

5. Remove the accelerating pump cover retaining screws. Remove the accelerating pump cover, diaphragm assembly, vent valve (if so equipped) and spring (Fig. 17).

If necessary, separate the vent rod and spring from the bracket and remove the plug from the vent rod.

6. If it is necessary to remove the Elastomer valve, grasp it firmly and pull it out. If the Elastomer valve tip broke off during removal, be sure to remove the tip from the fuel bowl. **An Elastomer valve must be replaced whenever it has been removed from the carburetor.**

7. Invert the main body and remove the power valve cover and the gasket. Remove the power valve with a box wrench or socket wrench (Fig. 18). Remove the power valve gasket. Discard the gasket.

8. Remove the idle fuel mixture adjusting screws (needles) and the springs.

9. If necessary, remove the nut and washer securing the fast idle adjusting lever assembly to the throttle shaft, and remove the lever assembly (Fig. 10). If necessary, remove the idle screw and the retainer from the fast idle adjusting lever.

10. Remove the anti-stall dashpot, if so equipped.

11. If it is necessary to remove the throttle plates, lightly scribe the throttle plates along the throttle shaft, and mark each plate and its corresponding bore with a number or letter for proper installation (Fig. 19).

12. Slide the throttle shaft out of the main body.

CLEANING AND INSPECTION

Clean and inspect the carburetor component parts. Refer to Part 10-1, Section 3 for the proper procedure.

ASSEMBLY

Make sure all holes in the new gaskets have been properly punched and that no foreign material has adhered to the gaskets. Make sure the accelerating pump diaphragm is not torn or cut.

The carburetor assembly is shown in Fig. 20.

MAIN BODY

1. Slide the throttle shaft assembly into the main body.

2. Refer to the lines scribed on the throttle plates and install the throttle plates in their proper location with the screws snug, but not tight.

3. Close the throttle plates. Invert the main body, and hold it up to the light. Little or no light should show between the throttle plates and the throttle bores. Tap the plates lightly with a screwdriver handle to seat them. Hold the throttle plates closed and tighten and stake the retaining screws. **When staking the screws, sup-**

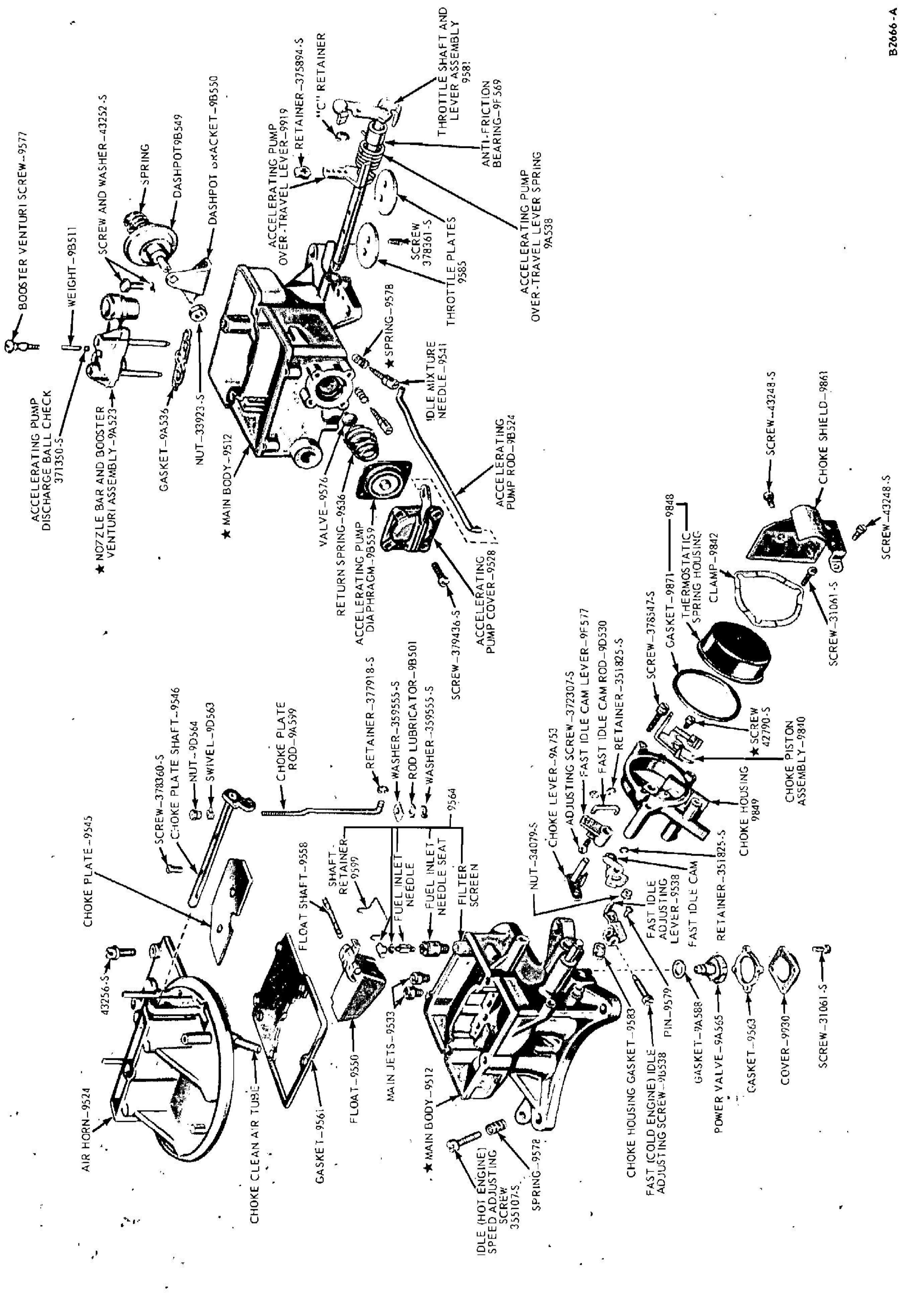


FIG. 20—Carburetor Assembly

port the shaft and plate on a block of wood or a metal bar to prevent bending of the shaft.

4. If necessary, install the fast idle screw pin and the screw on the fast idle adjusting lever.

5. Install the anti-stall dashpot, if so equipped.

6. If the fast idle lever was removed, place the fast idle lever assembly on the throttle shaft and install the retaining washer and nut (Fig. 10).

7. If the Elastomer valve was removed, lubricate the tip of a new Elastomer valve and insert the tip into the accelerator pump cavity center hole. Using a pair of needle nosed pliers, reach into the fuel bowl and grasp the valve tip. Pull the valve in until it seats in the pump cavity wall and cut off the tip forward the retaining shoulder. Remove the tip from the bowl.

8. Install the accelerating pump diaphragm return spring on the boss on the chamber (Fig. 17). Insert the diaphragm assembly in the cover and place the cover and diaphragm assembly into position on the main body. Install the cover screws. (If equipped with a vent valve, install the two cover screws that do not retain the vent valve bracket).

Insert a new plug in the vent rod. Install the vent rod spring on the vent rod (Fig. 17). Install the vent rod on the bracket and position the spring loop on the vent rod. Install the vent rod and bracket assembly on the accelerating pump and tighten the retaining screws.

9. Insert the accelerating pump operating rod into the inboard hole of the accelerating pump actuating lever. Position the accelerating pump operating rod retainer over the specified hole (Part 10-10) in the over-travel lever to suit the operating and climatic conditions under which the car is to be operated. Press the ends of the retainer together; then, at the same time, insert the operating rod through the retainer and the hole in the over-travel lever. Release the ends of the retainer to secure the rod.

10. Invert the main body. Install the power valve (economizer valve) and new gasket with a wrench (Fig. 18). **Tighten the valve securely.** Install the power valve cover and new gasket.

11. Install the idle mixture adjusting screws (needles) and springs (Fig. 18). Turn the needles in gently with the fingers until they just touch the seat, then back them off the specified (Part 10-11) turns for a preliminary idle fuel mixture adjustment.

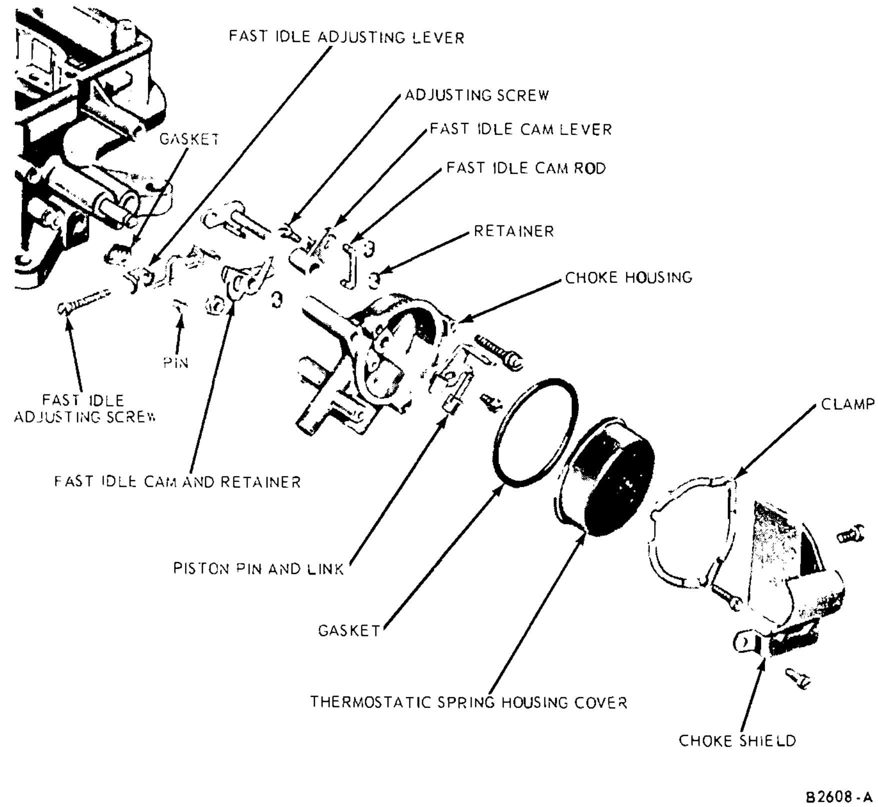


FIG. 21—Choke Housing Assembly

12. Install the main jets and the fuel inlet seat, filter screen, and new gasket, using a jet wrench (Figs. 14 and 15). **Be sure the correct jets are installed.**

13. Install the fuel inlet needle assembly in the fuel inlet seat. The fuel inlet needle and seat are matched assemblies. **Be sure the correct needle and seat are assembled together.**

14. Slide the float shaft into the float lever (Fig. 12). Position the float shaft retainer on the float shaft.

15. Insert the float assembly into the fuel bowl and hook the float lever tab under the fuel inlet needle assembly. Insert the float shaft into its guides at the sides of the fuel bowl.

16. With the use of a screwdriver, position the float shaft retainer in the groove on the fuel inlet needle seat (Fig. 13). Refer to Part 10-1, Section 2 and check the float setting.

17. Drop the accelerating pump discharge ball into its passage in the main body. Seat the ball with a brass drift and a light hammer. **Make sure the ball is free in the bore.** Drop the accelerating pump discharge weight on top of the ball. Position the new booster venturi gasket and the booster venturi in the main body. Install the air distribution plate (if so equipped) and the accelerator pump discharge screw (Fig. 16). Tighten the screw.

VACUUM PISTON CHOKE

1. If the choke piston and link was disassembled install the choke piston on the choke thermostatic spring lever link and install the retaining pin (Fig. 21).

2. Position the fast idle cam lever on the thermostatic choke shaft and lever assembly (Fig. 21). **The bottom of the fast idle cam lever adjusting screw must rest against the tang on the choke lever.** Insert the choke lever into the rear of the choke housing. Position the choke lever so that the hole in the lever is to the left side of the choke housing.

3. Insert the choke piston into the choke housing, and install the choke piston lever on the flange of the choke lever. Install the choke piston lever to choke lever retaining screw and washer (Fig. 11).

4. Install the fast idle cam rod on the fast idle cam lever. Place the fast idle cam on the fast idle cam rod and install the retainer. Place the choke housing vacuum pick-up port to main body gasket on the choke housing flange. Position the choke housing on the main body and

at the same time, install the fast idle cam on the hub on the main body. Position the gasket, and install the choke housing retaining screws. Install the fast idle cam retainer. **The thermostatic spring housing is installed after the choke plate clearance (pull-down) has been adjusted to specification.**

AIR HORN

Refer to Fig. 9 for the correct location of the parts.

1. If the choke plate shaft was removed, position the choke plate shaft in the air horn. Place the choke plate rod seal between the two brass washers and slide them into position on the choke plate rod seal retainer.

Insert the choke plate rod through the rod seal and the air horn. Insert the choke plate rod into the choke shaft lever clevis nut, and turn the nut clockwise to thread the rod onto the nut.

2. If the choke plate was removed, insert the choke plate into the choke plate shaft. Install the choke plate screws snug, but not tight. Check for proper plate fit, binding in the air horn and free rotation of the shaft by moving the plate from the closed position to the open position. If necessary, remove the choke plate and grind or file the plate edge where it is binding or scraping on the air horn wall. If the choke plate and shaft moves freely, tighten the choke plate screws while holding the choke in the fully-closed position. Stake the screws. **When staking the screws, support shaft and plate on a block of wood or a metal bar to prevent bending of the shaft.**

3. Position the air horn gasket on the main body, with the fuel bowl vent hole in the gasket located opposite the fuel inlet.

4. Position the air horn over the main body and insert the end of the choke plate rod into the automatic choke lever. Install the air horn retaining screws and the carburetor identification tag. Tighten the retaining screws. Install the choke plate rod retainer. Install the air cleaner anchor screw.

5. Refer to Part 10-1, Section 2 Common Adjustments and Repairs and perform the automatic plate clearance (pull-down), vent valve adjustment (if so equipped) and fast idle cam linkage adjustment. Perform a fuel level float adjustment (wet) after the carburetor has been installed on the car.

PART 10-5—*Autolite Model 4100 4-V Carburetor*

1 DESCRIPTION AND OPERATION

DESCRIPTION

The Autolite Model 4100 4-V (venturi) carburetor (Figs. 1, 2 and 3) has two main assemblies; the air horn, and the main body.

The air horn assembly, which serves as the main body cover, contains the choke plate, hot idle compensator, vents for the fuel bowls, secondary throttle control vacuum tubes, and the automatic choke clean air pick-up tube. A rubber hose and steel tube connects the clean air pickup tube to the automatic choke heat chamber in the right exhaust manifold.

The primary and secondary throttle plates, accelerating pump assembly, power valve assembly, secondary operating diaphragm assembly and the fuel bowls are in the main body. The automatic choke housing is attached to the main body.

The two primary (front) barrels each contain a main and booster venturi, main fuel discharge, accelerating pump discharge, idle fuel discharge and a primary throttle plate.

The two secondary (rear) barrels each have a main fuel discharge, and a vacuum operated throttle plate.

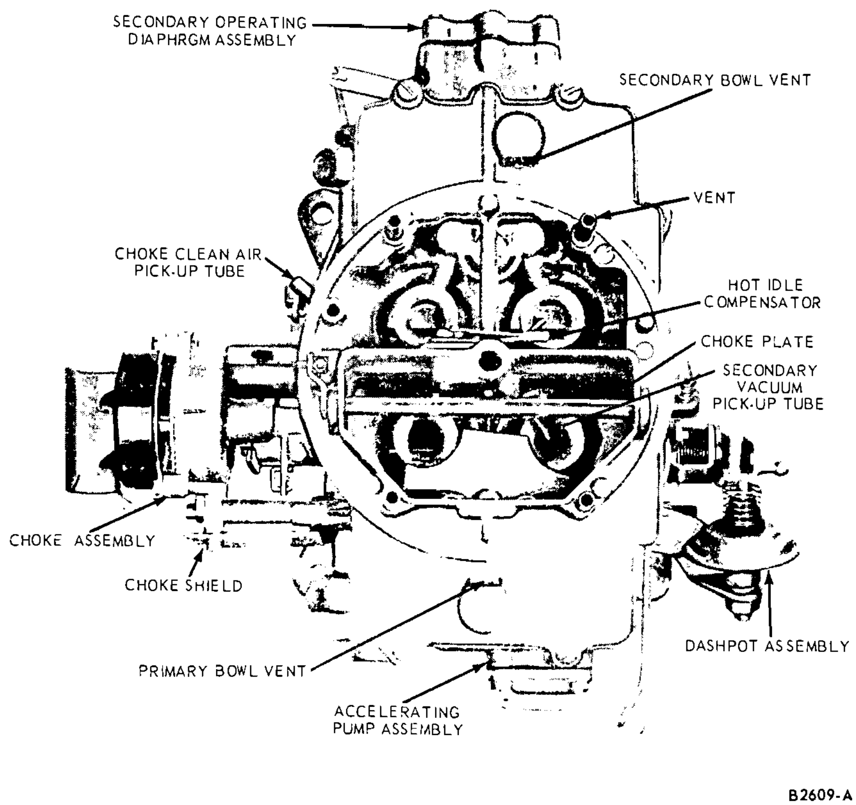


FIG. 1—Autolite Model 4100 4-V Carburetor — Top View—Air Horn Installed

OPERATION

FUEL INLET SYSTEM

A separate fuel bowl is provided for the primary and secondary stages (Fig. 4). The fuel enters the primary fuel bowl through the fuel inlet. A drilled passage through the right side of the main body connects the fuel bowls. The pressure in the two fuel bowls is balanced by means of a pressure equalizing chamber built into the left side of the main body. Two baffles in the internal fuel equalizer passage between the primary and secondary fuel bowls permit proper control and balance of the metering forces within each fuel bowl.

The amount of fuel entering a fuel bowl is regulated by the distance the fuel inlet needle is raised off its seat and by fuel pump pressure. Movement of the fuel inlet needle in relation to the seat is controlled by the float and lever assembly which rises and falls with the fuel level. When the fuel in the fuel bowl reaches a pre-set level, the float lowers the fuel inlet needle to a position where it restricts the flow of fuel, admitting only enough fuel thru the filter screen to replace that being used.

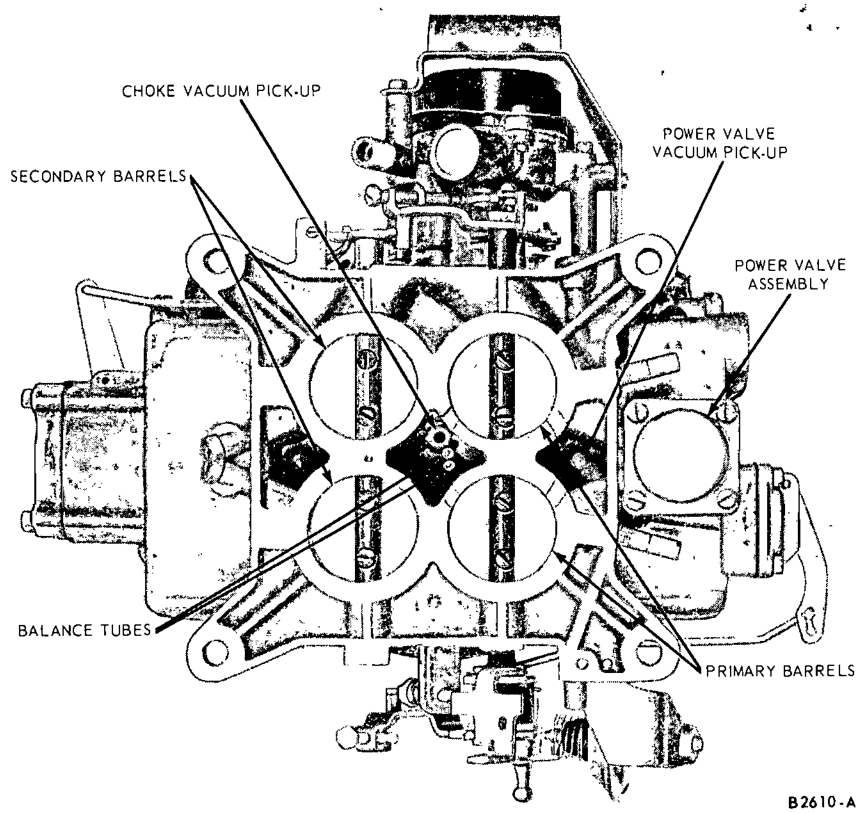


FIG. 2— Autolite Model 4100 4-V Carburetor — Bottom View

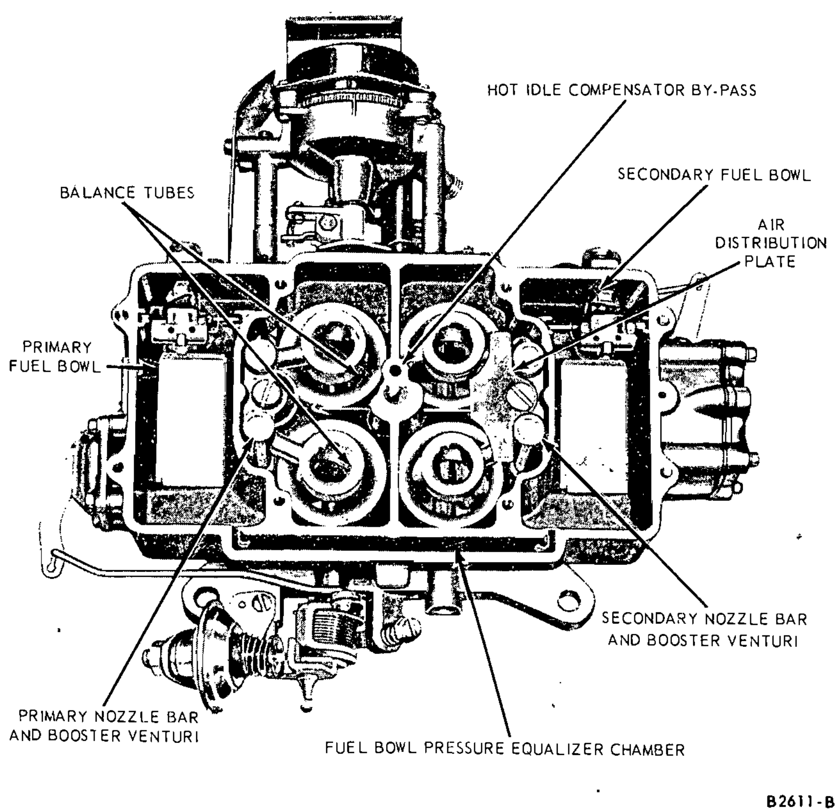


FIG. 3— Autolite Model 4100 4-V Carburetor —Top View—Air Horn Removed

A retracting clip is attached to the fuel inlet needle and hooks over the tab on the end of the lever of the float assembly. This clip assures reaction of the fuel inlet needle to any movement of the float. Downward movement of the float or float drop is controlled by the tab end of the float lever.

A wire-type retainer prevents movement of the float shaft within the guides on each side of the fuel bowl. The retainer fits into a groove on the inlet needle seat. The ends of the retainer are hooked over grooves on opposite ends of the float shaft.

The fuel filter screen, located below the inlet needle seat, prevents the entrance of foreign matter.

The primary and secondary fuel bowls are vented externally at all times. In addition, both the primary and secondary fuel bowls are internally vented into the air cleaner. The standpipe pitot tubes in the primary and secondary internal vent tube openings raise the level of the internal vent openings above the external vent openings. This provides the necessary pressure differential for proper evacuation of the gaseous vapors through the external vent during a hot soak period.

An integral anti-splash washer is located on top of each fuel inlet needle.

AUTOMATIC CHOKE SYSTEM

The choke plate, located in the air horn above the primary barrels, when closed, provides a high vacuum above as well as below the throttle plates. With a vacuum above the throttle plates, fuel will flow from the main fuel system as well as from the idle fuel system. This provides the extremely rich fuel mixture necessary for cold engine operation.

The carburetor choke shaft is linked to a thermostatic choke control mechanism mounted on the main body (Fig. 5).

The linkage between the choke lever and the throttle shaft is designed so that the choke plate will partially open when the accelerator pedal is fully depressed. This permits unloading of a flooded engine.

The automatic choke is equipped with a bi-metal thermostatic spring and a vacuum piston (Fig. 5). The bi-metal thermostatic spring mechanism winds up when cold and unwinds when warm. When the engine is cold, the thermostatic spring, through attaching linkage, holds the choke piston upward and the choke plate in a closed position prior to engine start. Manifold vacuum chan-

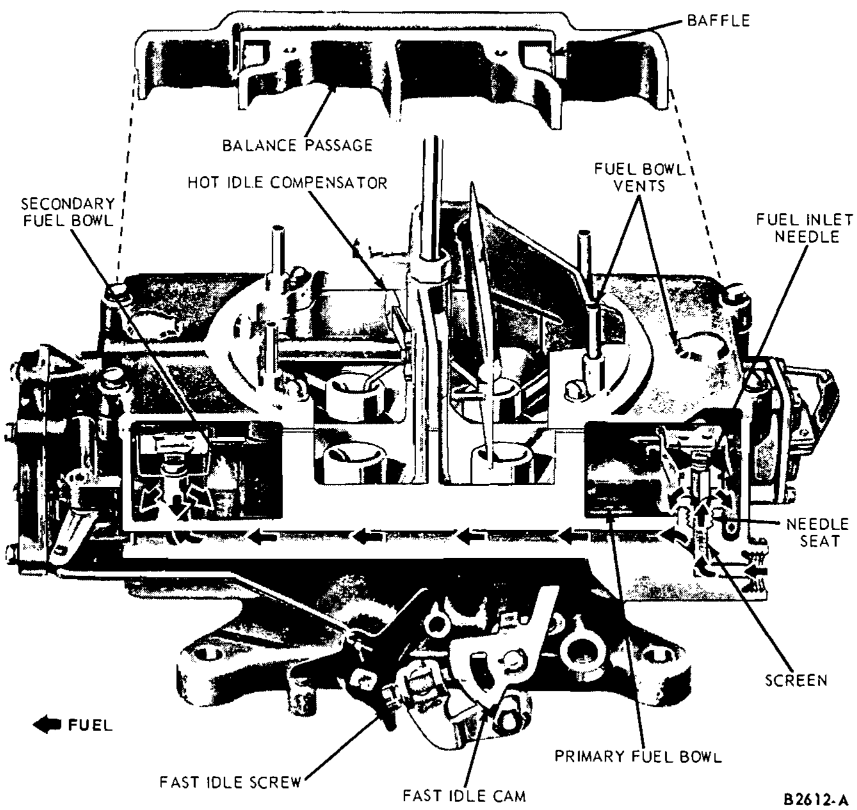


FIG. 4—Fuel Inlet System

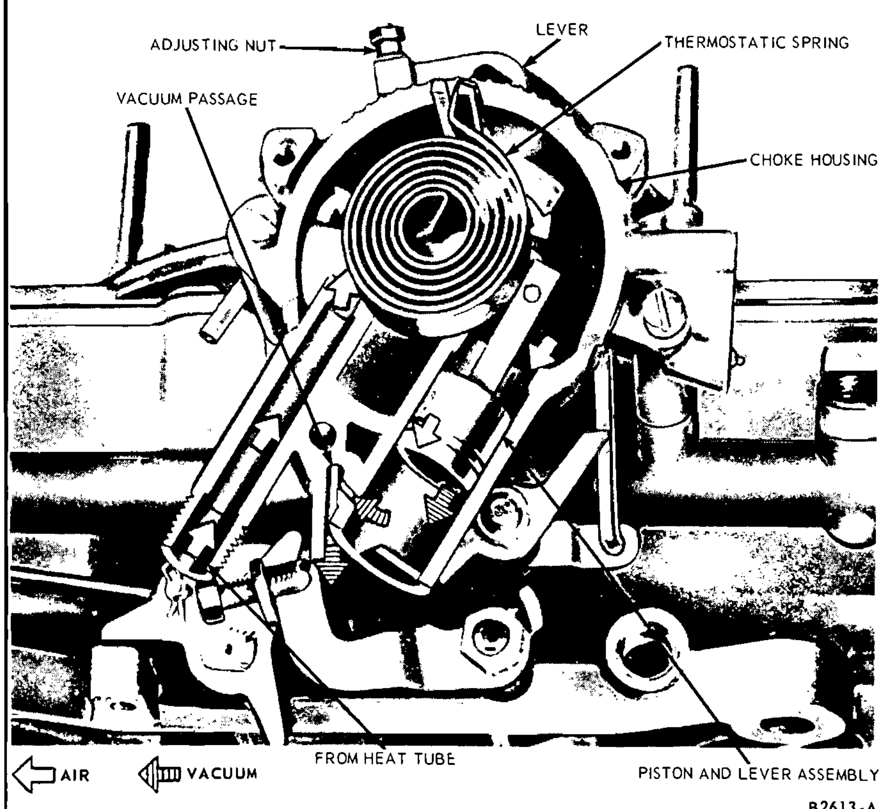


FIG. 5—Automatic Choke System

neled through a passage in the choke control housing draws the choke vacuum piston downward, exerting an opening force on the choke plate.

When the engine is started, manifold vacuum acting directly on the piston, located in the choke housing, immediately moves the choke plate against the tension of the thermostatic spring to a partially open position to prevent stalling.

As the engine continues to operate, manifold vacuum draws heated air from the exhaust manifold heat chamber. The amount of air entering the choke housing is controlled by restrictions in the air passages in the carburetor.

The warmed air enters the choke housing and heats the thermostatic spring, causing it to unwind. The tension of the thermostatic spring gradually decreases as the temperature of the air from the heat chamber rises, allowing the choke plate to open. The air is exhausted into the intake manifold.

When the engine reaches its normal operating temperature, the thermostatic spring exerts tension on the choke plate forcing it to the full open position. In this position, the choke piston is at its lowest point in the cylinder. Slots in the piston chamber wall allow sufficient air to bleed past the piston and into the intake manifold, causing a continual flow of warm air to pass through the thermostatic spring housing. The spring remains heated and the choke plate remains fully open until the engine is stopped and allowed to cool.

The choke rod actuates the fast idle cam during choking. Steps on the edge of the fast idle cam contact the fast idle adjusting screw. This permits a faster engine idle speed for smoother running when the engine is cold. As the choke plate is moved through its range of travel from the closed to the open position, the choke rod rotates the fast idle cam. Each step on the fast idle cam permits a slower idle rpm as engine temperature rises and choking is reduced.

During the warm-up period, if the engine should reach the stall point due to a lean mixture, manifold vacuum will drop considerably. The tension of the thermostatic spring then overcomes the lowered vacuum acting on the choke piston and the choke plate is moved toward the closed position, providing a richer mixture to help prevent stalling.

The linkage between the choke lever and the throttle shaft is designed so that the choke plate will partially open when the accelerator

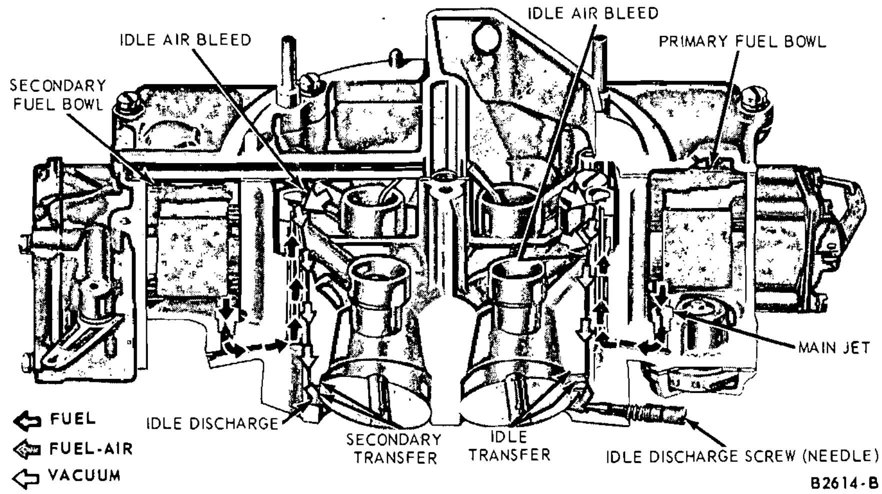


FIG. 6—Idle Fuel System

pedal is fully depressed. This permits unloading of a flooded engine.

IDLE FUEL SYSTEM

The difference in pressure between the fuel bowls and the idle discharge ports forces fuel through the primary and secondary stage idle fuel systems.

Primary Stage

Fuel flows from the primary stage fuel bowl through the main jet and into the bottom of the main well (Fig. 6).

From the main well, the fuel flows up through the idle tube and through a short diagonal passage in the booster venturi assembly into the idle passage in the main body. A calibrated restriction, at the upper tip of the idle tube, meters the flow of fuel.

Air enters the system from the air bleed located directly above the idle tube. The air bleed also acts as a vent to prevent siphoning at off-idle or high speeds and when the engine is stopped. The fuel and air pass down a diagonal passage in the booster venturi and through a calibrated restrictor. Additional air is bled into the system through an air bleed located at the bottom of the diagonal passage where the fuel enters the idle passage in the main body.

Fuel flows down the idle passage in the main body past two idle transfer holes. The idle transfer holes act as additional air bleeds at curb idle. The fuel then flows past the pointed tip of the adjusting needle which controls the idle fuel discharge in the primary stage. From the adjusting needle chamber, the fuel flows through a short horizontal passage and is discharged below the primary throttle plates.

During off-idle when the primary throttle plate is moved slightly past the idle transfer holes, each hole begins discharging fuel as it is exposed to manifold vacuum. As the primary throttle plate is opened still wider and engine speed increases, the air flow through the carburetor is also increased. This creates a vacuum in the booster venturi strong enough to bring the primary stage main fuel system into operation. Fuel flow from the primary idle fuel system begins tapering off as the main fuel system begins discharging fuel.

Hot Idle Compensator System

A thermostatically controlled hot idle compensator is located on the air horn above the secondary booster venturis (Fig. 7). At carburetor high inlet air temperatures, the hot idle compensator will open and allow air to bypass the throttle plates through a passage in the air horn and main body and enter the intake manifold. This improves idle stability and minimizes the effect of fuel vaporization which results in excessively rich idle mixtures.

Secondary Stage

Fuel flows from the secondary

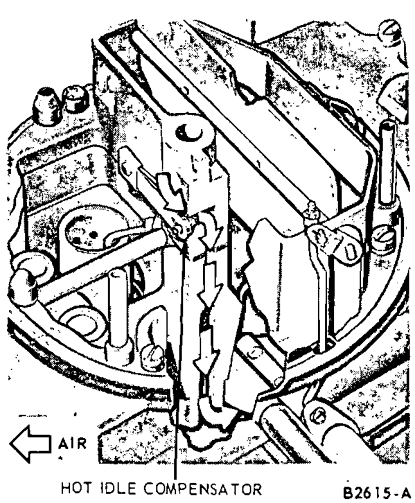


FIG. 7—Hot Idle Compensator System

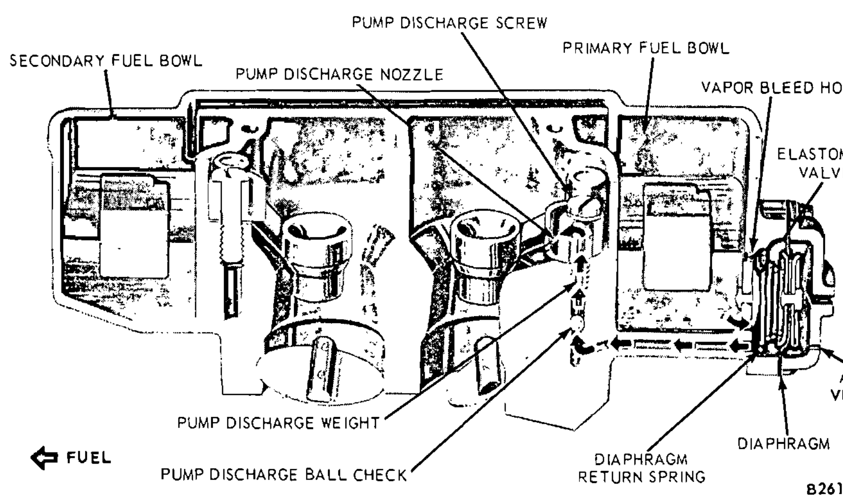


FIG. 8—Accelerating System

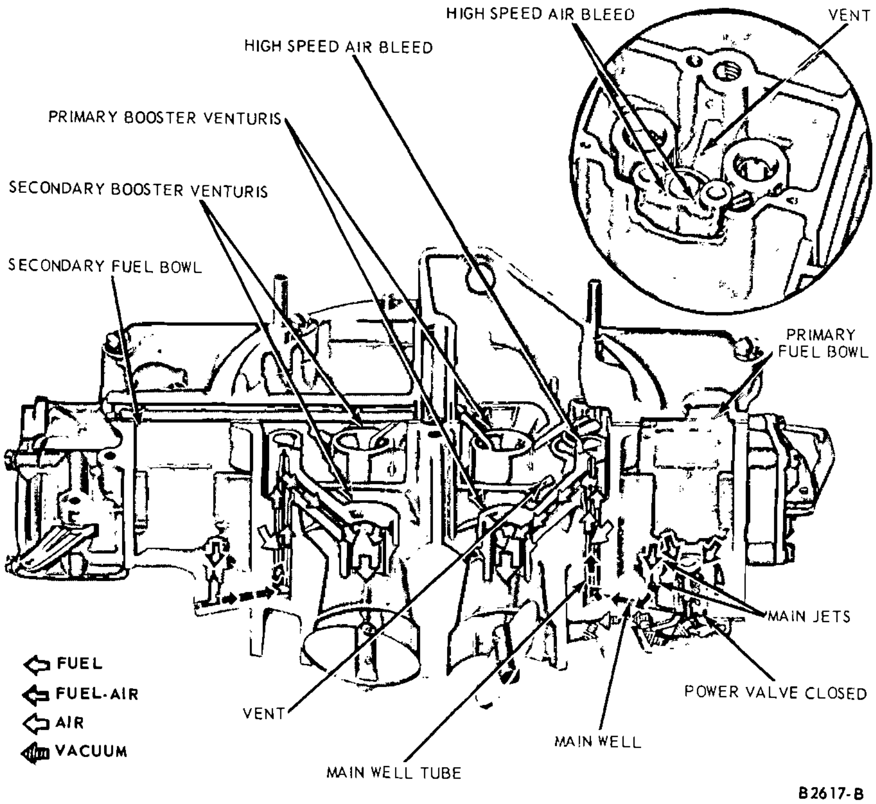


FIG. 9—Primary Stage Main Fuel System

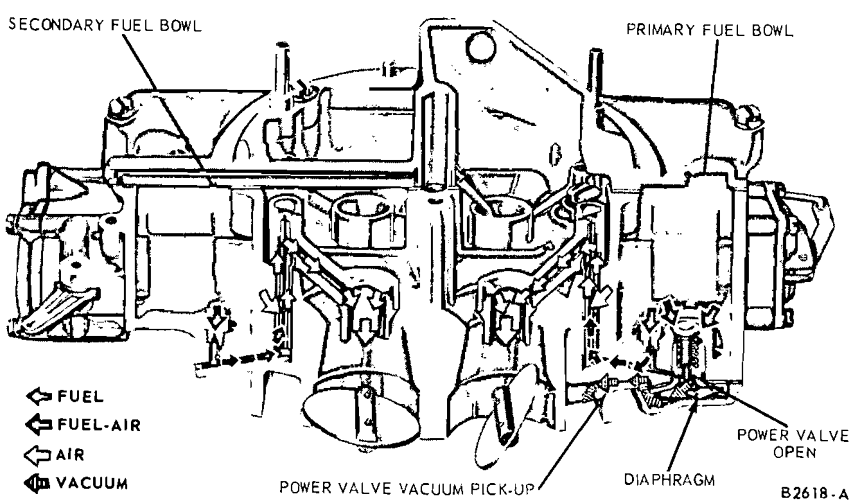


FIG. 10—Power Fuel System

stage fuel bowl through the main jet and into the bottom of the main well (Fig. 6).

From the main well, the fuel flows up through the idle tube and through a short diagonal passage in the booster venturi assembly and then into the idle passage in the main body. A calibrated restriction, at the upper tip of the tube, meters the flow of fuel.

Fuel flows down the idle passage in the main body, past two transfer holes above the closed throttle plate, and flows through a metered restriction into a short horizontal passage where it is discharged into the secondary barrel below the closed throttle plate. The transfer holes act as air bleeds at idle. The secondary idle fuel system continues discharging fuel until the secondary main fuel system comes into operation.

Air is introduced into the secondary stage idle fuel system from the idle air bleed, located directly above the idle tube. The air bleed also acts as a vent to prevent siphoning in the idle fuel system at high speeds and when the engine is stopped.

ACCELERATING SYSTEM

Upon acceleration the air flow through the carburetor responds almost immediately to the increased throttle opening. There is, however, a brief interval before the flowing fuel, which is heavier than air, can gain speed to maintain the desired balance of fuel and air. During this interval, the accelerating system (Fig. 8) supplies fuel until the other systems can once again provide the proper mixture.

When the throttle is closed, the diaphragm return spring forces the diaphragm toward the cover, drawing fuel into the chamber through the inlet. The inlet has an Elastomer valve which uncovers the inlet hole to admit fuel from the fuel bowl. The valve covers the inlet hole when the accelerating pump is operated to prevent the fuel from returning to the bowl. A discharge weight and ball check prevents air from entering from the discharge nozzle when fuel is drawn into the diaphragm chamber.

When the throttle is opened, the diaphragm rod is forced inward, forcing fuel from the chamber into the discharge passage. Fuel under pressure forces the pump discharge weight and ball off their seat and fuel passes through the accelerating pump discharge screw and is sprayed into each main venturi through discharge ports.

An air bleed in the wall of the accelerator pump fuel chamber prevents vapor entrapment and pressure build-up in the diaphragm chamber.

PRIMARY STAGE MAIN FUEL SYSTEM

As engine speed increases, the air passing through the booster venturi creates a vacuum. The amount of vacuum is determined by the air flow through the venturi, which in turn is regulated by the speed of the engine. The difference in pressure between the main discharge port and the fuel bowl causes fuel to flow through the main fuel system (Fig. 9).

At a predetermined venturi vacuum, fuel flows from the primary fuel bowl, through the main jets, and into the bottom of the main well. The fuel moves up the main well tube past air bleed holes. Filtered air from the high speed air bleed enters

the fuel flow in the main well tube through holes in the side of the tube. The high speed air bleed meters an increasing amount of air to the fuel as venturi vacuum increases, maintaining the required fuel-air ratio. The mixture of fuel and air is lighter than raw fuel and responds faster to changes in venturi vacuum. It also atomizes more readily than raw fuel. The fuel and air continue up the main well tube past another air bleed which also acts as a vent to prevent siphoning when the engine is shut down. The fuel is discharged into the booster venturi where it is atomized and mixed with the air flowing through the carburetor.

The throttle plate controls the amount of the fuel-air mixture admitted to the intake manifold, regulating the speed and power output of the engine.

A balance tube is located in each primary barrel directly below the booster venturi. When decelerating, the balance tube siphons off any excess fuel droplets remaining around the edge of the booster venturi and discharges the droplets into the equalizing slots in the base of the carburetor where they are mixed with the idle fuel. The balance tube also acts as an additional air bleed during the idle fuel system operation.

POWER FUEL SYSTEM

During periods of increased road loads or high speed operation, the fuel-air ratio must be increased for added power. The added fuel required during this period is supplied ty the power fuel system (Fig. 10).

The power fuel system is controlled by manifold vacuum.

Manifold vacuum is transmitted from an opening in the base of the main body, through a passage in the main body and power valve chamber to the power valve diaphragm. The manifold vacuum, acting on the power valve at idle speed or normal road load conditions, is great enough to hold the power valve diaphragm down, overcoming the tension of the spring on the valve stem and holding the valve closed. When high power operation places a greater load on the engine and manifold vacuum drops below a predetermined value, the spring opens the power valve. Fuel from the primary fuel bowl flows through the power valve and into passages leading to both primary stages main fuel wells. Here the fuel is added to the fuel from the primary stage main fuel system, enriching the mixture.

As engine power demands are re-

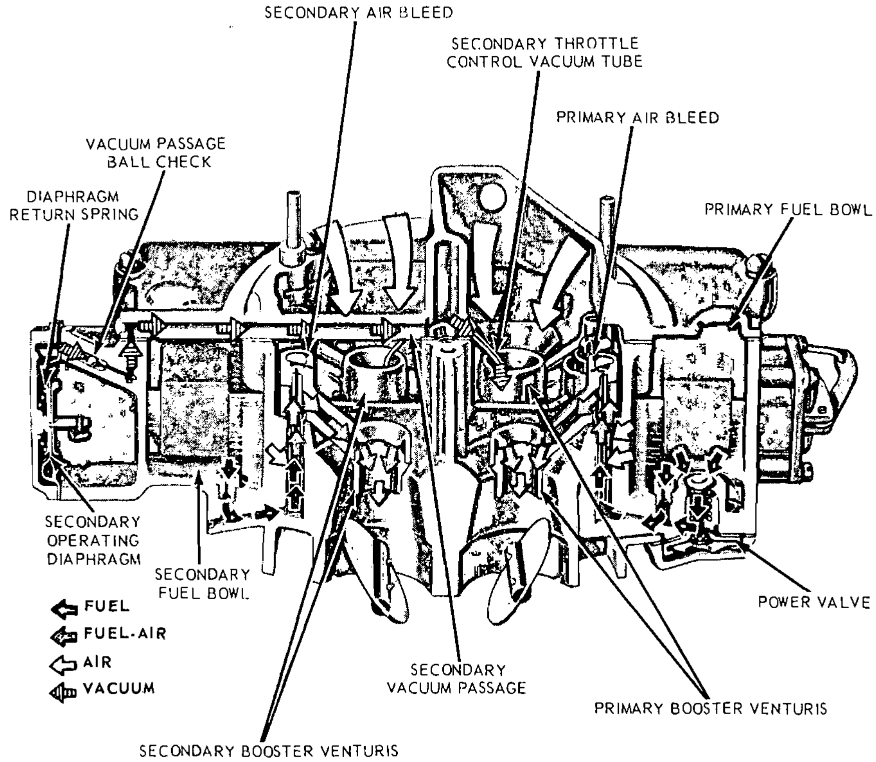


FIG. 11—Secondary Stage Main Fuel System

duced, manifold vacuum increases. The increased vacuum overcomes the tension of the valve stem spring and closes the power valve.

SECONDARY THROTTLE OPERATION AND MAIN FUEL SYSTEM

To provide sufficient fuel-air mixture to operate the engine at maximum power, the mixture supplied by the primary stage is supplemented by an additional quantity of fuel-air mixture from the secondary stage (Fig. 11).

This additional supply of fuel-air mixture is delivered through the two secondary (rear) barrels of the carburetor. The secondary stage throttle plates are operated by a spring-loaded vacuum diaphragm assembly attached to the main body and linked to the secondary throttle shaft.

Opening of the secondary throttle plates is controlled by vacuum from the left primary booster venturi. The vacuum is transmitted from the secondary throttle control vacuum tube through passages in the air horn, main body, and behind the secondary operating diaphragm.

As the primary throttle plates are opened, primary venturi vacuum increases. When the vacuum reaches a predetermined amount, it starts to act on the secondary stage operating diaphragm, which in turn starts to open the secondary throttle plates.

A ball check, located in the vacuum passage in the diaphragm housing, controls the rate at which the secondary throttle plates are allowed to open. Any rapid increase in vacuum which would tend to open the secondary throttle plates too suddenly holds the ball check against its seat. The opening of the secondary throttle plates is slowed to a rate governed by the amount of vacuum passing through a bleed in the ball seat.

As the secondary throttle plates begin to open, fuel flows from the secondary fuel bowl through the secondary main jets into the bottom of the main well and up the main well tube past air bleed holes. Air is introduced through an air bleed at the top of the tube. When the secondary throttle plates are moved slightly past the secondary transfer holes, each hole begins discharging fuel as it is exposed to manifold vacuum. As secondary venturi vacuum is increased, the fuel is discharged into the secondary booster venturi. Fuel from the transfer holes tapers off and the holes act as additional air bleeds.

When decelerating, vacuum in the

primary venturi decreases and the secondary throttle plates begin to close. The ball check in the diaphragm housing passage will unseat when the throttle is closed quickly, allowing the low pressure on the vacuum side of the diaphragm to rapidly return to atmospheric pressure. As the vacuum acting on the diaphragm is lessened, the load on the diaphragm spring will start closing the secondary plates.

2 REMOVAL AND INSTALLATION

REMOVAL

Flooding, stumble on acceleration, and other performance complaints are, in many instances, caused by the presence of dirt, water, or other foreign matter in the carburetor. To air in diagnosing the cause of a complaint, the carburetor should be carefully removed from the engine without removing the fuel from the bowls. The contents of the bowls may then be examined for contamination as the carburetor is disassembled.

1. Remove the air cleaner (Part 10-8, Section 2). Remove the bracket that secures the heater hose to the automatic choke. Remove the throttle cable from the throttle lever. Disconnect the distributor vacuum line (if so equipped), in-line fuel filter, choke clean air tube and the choke heat tube at the carburetor.
2. Remove the carburetor retaining nuts and lock washers; then remove the carburetor. Remove the spacer upper gasket. Discard the gasket. **Whenever the carburetor is removed from the engine, care must be exercised to prevent damage to the throttle plates. The lower edges of the throttle plates project below the carburetor body whenever they are open.**
3. Remove the spacer and lower gasket. Discard the gasket.

INSTALLATION

1. Clean the gasket surface of the intake manifold, spacer and carburetor. Place a new gasket above and below the spacer and install the spacer. Position the carburetor on the spacer. Install the carburetor retaining nuts. To prevent leakage, distortion or damage to the carburetor body flange, snug the carburetor retaining nuts; then, alternately tighten the nuts in a criss-cross pattern to the specified torque (Part 10-11).

2. Connect the choke heat tube, in-line fuel filter, choke clean air tube and the distributor vacuum line (if so equipped). Connect the throttle cable to the throttle lever. Refer to Common Adjustments and Repairs (Part 10-1, Section 2) and adjust the accelerating pump stroke (if necessary); the idle fuel mixture and idle speed, and the anti-stall dashpot (if so equipped). Install the air cleaner (Part 10-8, Section 2).

3 MAJOR REPAIR OPERATIONS

DISASSEMBLY

To facilitate working on the carburetor and to prevent damage to the throttle plates, install carburetor legs on the base. If legs are unavailable, install 4 bolts (about 2 1/4 inches long of the correct diameter) and 8 nuts on the carburetor base.

Use a separate container for the component parts of the various assemblies to facilitate cleaning, inspection and assembly.

For a complete carburetor overhaul, follow all the steps. To partially overhaul the carburetor or to install a new gasket kit, follow only the applicable steps.

Refer to Fig. 24 for parts identification.

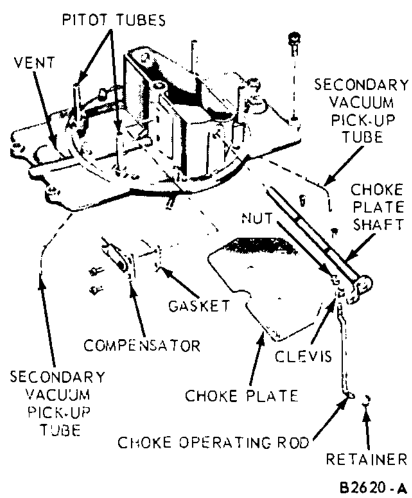


FIG. 12—Air Horn Assembly

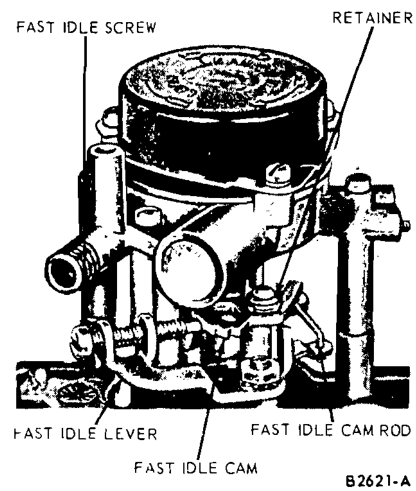


FIG. 13—Fast Idle Cam and Fast Idle Lever

AIR HORN

1. Remove the air cleaner anchor screw.
2. Remove the choke plate operating rod to choke lever retainer (Fig. 12).
3. Remove the air horn retaining screws and lock washers and the identification tag. Remove the air horn and air horn gasket.
4. If it is necessary to remove the choke plate rod, seal and washers, remove the choke plate rod by loosening and turning the choke shaft lever clevis nut counterclockwise. Remove the rod from the air horn. Slide the felt seal and two washers out of the choke rod seal retainer.
5. If it is necessary to remove

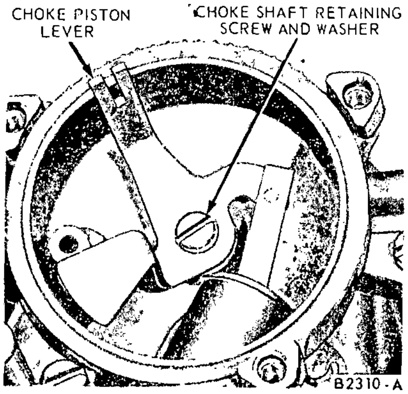


FIG. 14—Choke Shaft and Piston Lever

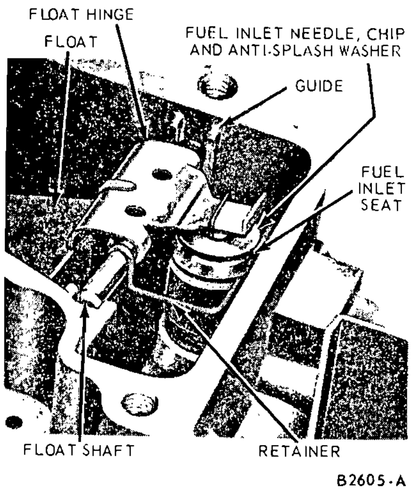


FIG. 15—Float Assembly

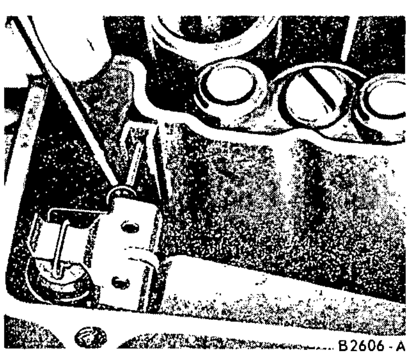


FIG. 16—Float Shaft Retainer Removal or Installation

the choke plate or choke shaft, remove the staking marks on the choke plate retaining screws and remove the screws. **If the tips of the screws are flared excessively, file off the flared portion to prevent damage to the threads of the shaft.** Remove the choke plate by sliding it out of the shaft, from the top of the air horn.

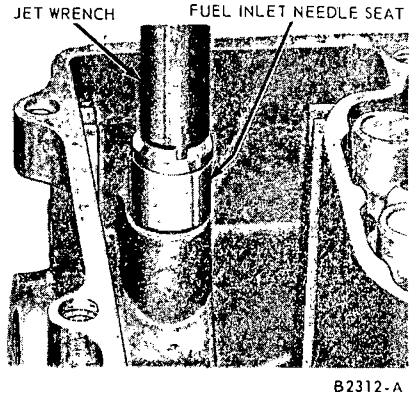


FIG. 17—Fuel Inlet Needle Seat Removal or Installation

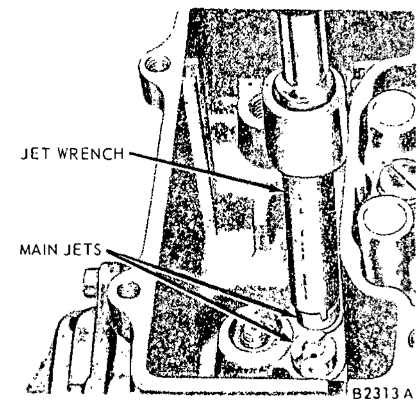


FIG. 18—Main Jet Removal or Installation

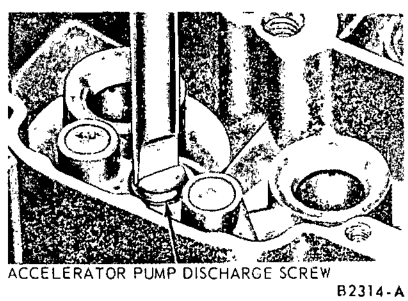


FIG. 19—Booster Venturi Removal or Installation

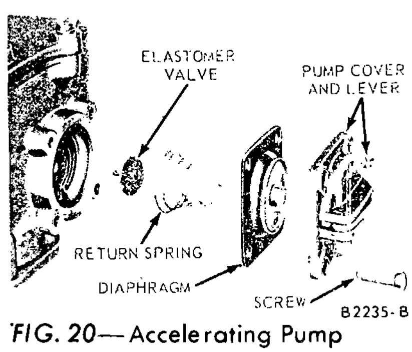


FIG. 20—Accelerating Pump Assembly

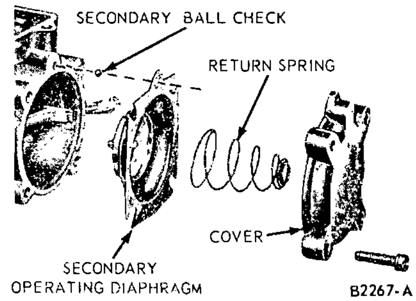


FIG. 21—Secondary Diaphragm Assembly

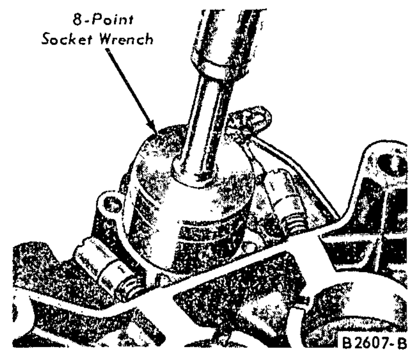


FIG. 22—Power Valve Removal or Installation

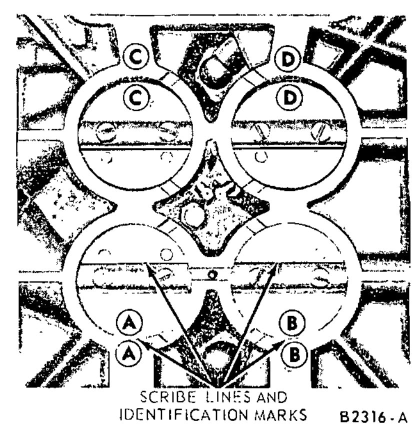


FIG. 23—Throttle Plate Removal

Slide the choke shaft out of the air horn.

6. If it is necessary to remove the secondary throttle control vacuum tubes, pry them out with needle nose pliers. Discard the tubes after removal.

7. If it is necessary to replace the hot idle compensator, remove the staking marks on the retaining screws and remove the hot idle compensator.

VACUUM PISTON CHOKE

1. Remove the fast idle cam retainer (Fig. 13).

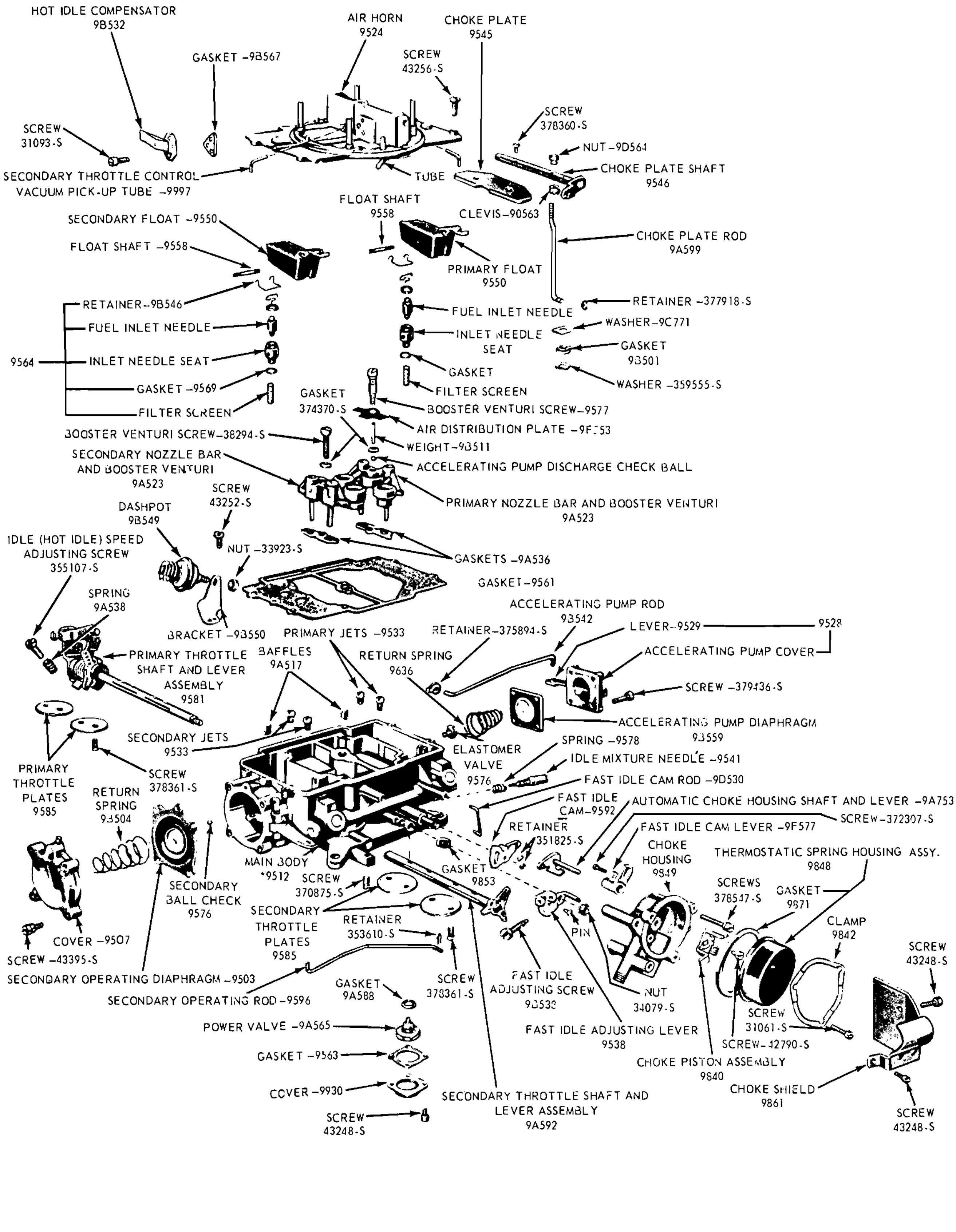


FIG. 24—Carburetor Assembly

2. Remove the thermostatic choke spring housing retaining screws, and remove the clamp, housing and gasket (Fig. 13).

3. Remove the choke housing assembly retaining screws. If the air horn was not previously removed, remove the choke control rod retainer. Remove the choke housing assembly, gasket and the fast idle cam. Remove the fast idle cam and rod from the fast idle cam lever.

4. Remove the choke lever retaining screw and washer (Fig. 14). Remove the choke piston lever from the housing. If necessary, remove the pin securing the choke piston to the choke lever link. Remove the choke lever and fast idle cam lever from the choke housing.

MAIN BODY

1. With the use of a screwdriver, pry the float shaft retainer from the fuel inlet seat in each fuel bowl (Figs. 15 and 16). Remove the floats, float shaft retainers and fuel inlet needle assemblies. Remove the retainer and float shaft from each float lever.

2. Using a jet wrench, remove the fuel inlet needle seat, gasket and filter screen from each fuel bowl (Fig. 17).

3. Remove the primary stage and secondary stage main jets (Fig. 18).

4. Remove the primary stage booster venturi assembly, air distribution plate and gasket (Fig. 19). Invert the main body and let the accelerating pump discharge weight and ball fall into the hand.

5. Remove the secondary stage booster venturi assembly and gasket.

6. Remove the accelerating pump operating rod retainer. To release the rod from the retainer clip, press the tab ends of the clip together; then, at the same time, press the rod away from the clip until it is disengaged. Remove the rod. Remove the accelerating pump cover, diaphragm assembly and spring (Fig. 20).

If it is necessary to remove the Elastomer valve, grasp it firmly and pull it out. If the Elastomer valve tip broke off during removal, be sure to remove the tip from the fuel bowl. **An Elastomer valve must be replaced whenever it is removed from the main body.**

7. Remove the secondary diaphragm operating rod retainer and remove the rod. Remove the diaphragm cover, return spring, Palnut (if so equipped) and diaphragm (Fig. 21). Invert the main body and let the secondary ball check fall into the hand.

8. Invert the main body and remove the power valve cover and gasket. Using a socket wrench or box wrench, remove the power valve and gasket (Fig. 22).

9. Remove the idle fuel mixture adjusting screws (needles) and springs.

10. Remove the anti-stall dashpot, if so equipped.

11. If necessary, remove the idle (hot engine) adjusting screw and spring, and the nut and washer securing the fast idle adjusting lever assembly to the primary throttle shaft (Fig. 13). Remove the lever assembly.

12. If it is necessary to remove the throttle plates, lightly scribe the primary and secondary throttle plates along the throttle shafts, and mark each plate and its corresponding bore with a number or letter for proper installation (Fig. 23).

Remove the staking marks on the throttle plate retaining screws and remove the screws. **If the tips of the screws are flared excessively file off the flared portion to prevent damage to the threads of the shaft(s). Do not scratch the edge of the plates or walls of the barrels.** Remove the screws and the throttle plates.

Slide the primary and secondary throttle shafts out of the main body.

PARTS REPAIR OR REPLACEMENT

Clean and inspect the carburetor component parts. Refer to Cleaning and Inspection (Part 10-1, Section 3) for the proper procedure. Replace all worn or damaged parts.

ASSEMBLY

Make sure all holes in the new gaskets have been properly punched and that no foreign material has adhered to the gaskets. Make sure the accelerating pump diaphragm and secondary operating diaphragm are not torn or cut. The carburetor assembly is shown in Fig. 24.

MAIN BODY

1. If the throttle plates were removed, slide the primary throttle shaft assembly into the main body.

Refer to the lines and identification marks scribed on the throttle plates (Fig. 23), and install the primary throttle plates in their proper location with the screws snug, but not tight. Invert the main body and hold it up to the light. Little or no light should show between the throttle plates and the throttle bores. Tap the plates lightly with a screwdriver handle to seat them. Tighten and stake the screws.

Slide the secondary throttle shaft into the main body. Refer to the lines scribed on the secondary throttle plates and install the throttle plates in their proper location. To install the plates, follow the procedure given for the primary throttle plates.

Adjust the secondary throttle plates. Refer to Common Adjustments and Repairs (Part 10-1, Section 2) for the proper procedure.

2. Install the idle (hot engine) adjusting screw and spring.

3. If the fast idle lever was removed, place the fast idle lever assembly on the primary throttle shaft and install the retaining washer and nut (Fig. 13). **Do not install the fast idle cam or retainer at this time.**

4. Install the anti-stall dashpot, if so equipped.

5. If the Elastomer valve was removed, lubricate the tip of a new Elastomer valve and insert the tip into the accelerator pump cavity center hole (Fig. 20). Using a pair of needle nosed pliers, reach into the fuel bowl and grasp the valve tip. Pull the valve in until it seats and cut off the tip forward of the retaining shoulder. Remove the tip from the bowl. Position the diaphragm return spring on the boss in the chamber.

6. Position the accelerator pump diaphragm assembly to the cover and place the cover and diaphragm assembly in position on the return spring and main body. Install the cover screws finger-tight. Push the accelerating pump plunger the full distance of its travel and tighten the cover screws.

7. Install the accelerating pump operating rod. Refer to Common Adjustments and Repairs (Part 10-1, Section 2) and adjust the accelerating pump stroke.

8. Invert the main body. Using a socket wrench or box wrench, install the power valve and new gasket (Fig. 22). **Tighten the power valve securely.** Install the cover and new gasket.

9. Install the idle mixture adjusting screws (needles) and springs. Turn the needles in gently with the fingers until they just touch the seat, then, back them off the specified number of turns (Part 10-11) for a preliminary idle adjustment.

10. Drop the secondary discharge

ball check into the passage, in the main body (Fig. 21).

11. Install the secondary operating diaphragm and Palnut (if so equipped) on the secondary operating lever. Install the diaphragm return spring on the cover. Install the cover with the screws finger-tight. With the diaphragm in the extended position, tighten the cover screws. Install the secondary operating rod in the operating lever, and secure the rod to the secondary throttle shaft with the retaining clip.

Check the operation and seal of the secondary vacuum system by opening the primary and secondary throttle plates. Hold the secondary throttle plates open. Place a finger over the secondary vacuum inlet hole in the main body and release the secondary throttle plates. This is a check for vacuum leakage at the diaphragm. The throttle plates should not close fully. They will move slightly when released, but they must stop and should not move toward the closed position after the initial movement. Replace the diaphragm or tighten the cover screws as necessary to correct the vacuum leakage.

12. Using a jet wrench, install the primary and secondary main jets (Fig. 18). **Be sure the correct jets are installed for the primary and secondary systems (Part 10-11).**

13. Install the primary and secondary fuel inlet filters in the inlet valve seat mounting bores. Install the valve seats and gaskets (Fig. 17). Install the fuel inlet needle valves (Fig. 15).

14. Slide the primary float shaft into the float lever (Fig. 15). Position the float shaft retainer on the float shaft.

Insert the float assembly into the fuel bowl and hook the float lever tab under the fuel inlet needle clip. Insert the float shaft into its guides at the sides of the fuel bowl.

With the use of a screwdriver, position the float shaft retainer on the groove of the fuel inlet needle seat (Figs. 15 and 16).

15. Repeat step 14 on the secondary stage fuel bowl.

16. Refer to Float Adjustment (Dry) Part 10-1, Section 2, and perform a dry float fuel level adjustment on the primary and secondary floats.

17. Drop the accelerating pump discharge ball into its passage in the primary side of the main body. Seat the ball with a brass drift and a light hammer. **Make sure the ball is free.** Drop the accelerating pump discharge weight on top of the ball.

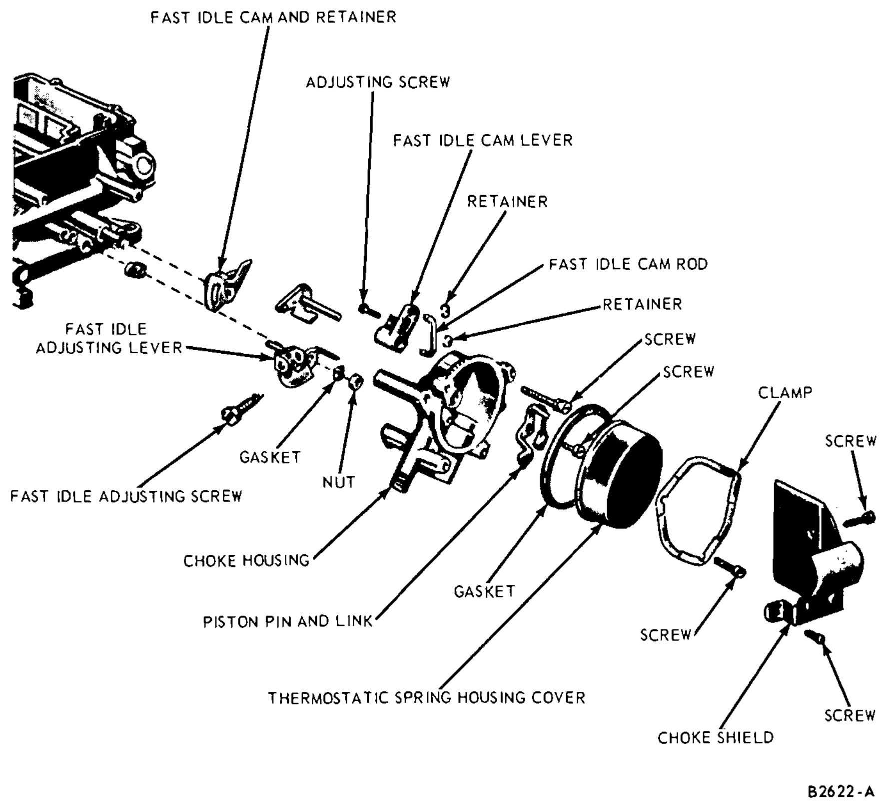


FIG. 25—Choke Housing Assembly

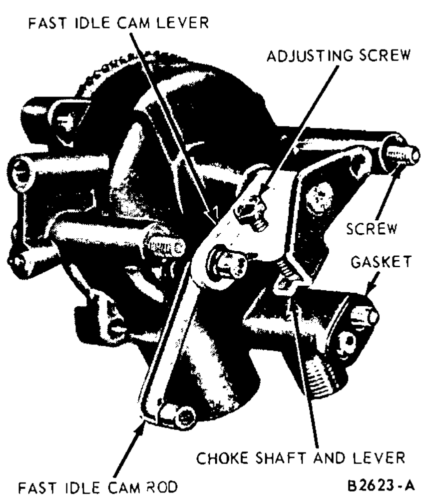


FIG. 26-Choke Linkage Installation

Position the primary booster venturi assembly and gasket in the main body. Install the air distribution plate and the retaining screw. Tighten the screw securely (Fig. 19). **The primary booster screw is hollow.**

18. Position the secondary booster venturi assembly and gasket in the main body, and install the gasket and retaining screw.

VACUUM PISTON CHOKE

1. If the choke piston and link

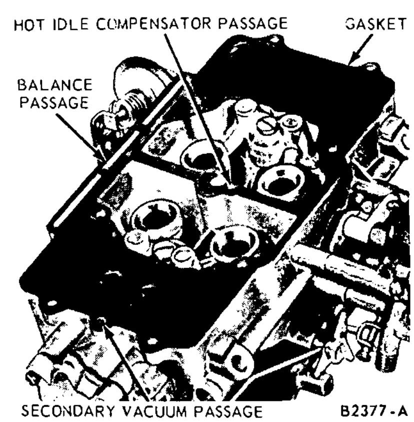


FIG. 27—Main Body Gasket Installation

was disassembled, install the choke piston on the choke thermostatic spring lever link and install the retaining pin (Fig. 25).

2. Position the fast idle cam lever on the thermostatic choke shaft and lever assembly (Figs. 25 and 26). **The bottom of the fast idle lever adjusting screw must rest against the tang on the choke shaft lever.** Insert the choke shaft assembly into the rear of the choke housing. Position the choke shaft lever so that the hole in the lever is to the left side of the choke housing (Fig. 26).

3. Insert the choke piston into the choke housing. Position the choke thermostatic spring lever on the flange of the choke shaft, and install the retaining screw and washer (Fig. 14).

4. Install the fast idle cam rod on the fast idle cam lever (Fig. 26). Place the fast idle cam on the fast idle cam rod and install the retainer.

Place the choke housing vacuum pick-up port to main body gasket on the choke housing flange. Position the choke housing on the main body, and at the same time, install the fast idle cam on the hub of the main body. Position the gasket and install the choke housing retaining screws. Install the fast idle cam retainer. **The thermostatic spring housing is installed after the choke plate clearance (pull-down) has been adjusted (Part 10-1, Section 2) to specification.**

AIR HORN

Refer to Fig. 12 for the correct location of the parts.

1. If the choke plate shaft was removed, position the choke plate shaft in the air horn. Insert the plastic choke pulldown adjusting nut and swivel into the keyed hole in the choke shaft lever. Position the felt washer between the two brass washers and slide them into place on the choke control rod seal retainer.

Insert the choke plate rod through the plate rod seal and the air horn. Insert the choke plate rod into the choke shaft lever clevis nut, and turn the nut clockwise to thread the rod onto the nut.

2. If the choke plate was removed, insert the choke plate into the choke plate shaft. Install the choke plate screws snug, but not tight.

Check for proper plate fit, binding in the air horn, and free rotation of the shaft by moving the plate from the closed position to the open position. If necessary, remove the choke plate and grind or file the plate edge where it is binding or scraping on the air horn wall. If the choke plate and shaft moves freely, tighten the choke plate screws while holding the choke in the fully-closed position. Stake the screws. **When staking the screws, support the shaft and plate on a block of wood or a metal bar to prevent bending of the shaft.**

3. If necessary, start new secondary throttle control vacuum tubes into the air horn. **Make certain the tubes are installed in a manner that will insure that the pick-up will face downward toward the primary booster venturi when the air horn is installed.** Drive each tube into the air horn by grasping it lightly below the shoulder with pliers and striking the pliers with a hammer. Drive each tube in until it stops against its shoulder. **Do not crush or bend the tubes. The tubes should not touch the booster venturi wall when the air horn is installed on the main body. The correct position of each tube is 0.020-0.060 inch from the wall.**

4. If the hot idle compensator was removed, install a new compensator and gasket. Stake the retaining screws.

5. Position the main body gasket on the main body (Fig. 27). Position the air horn on the main body and gasket so that the choke plate rod fits into the opening in the choke housing lever. Install the choke plate rod retainer. **Use care to prevent damage to the secondary throttle control vacuum tubes during the air horn installation.** Install the air horn retaining screws, lock washers and the carburetor identification tag. Tighten the screws.

6. Refer to Part 10-1, Section 2, Common Adjustments and Repairs and perform the automatic choke plate clearance (pulldown) and fast idle cam linkage adjustment.

7. Position the thermostatic choke spring housing on the choke housing. Install the spring housing on the choke housing and gasket, with the slot in the arm of the thermostatic spring lever inserted into the loop of the thermostatic spring. Position the spring housing retainer (clamp) over the spring housing and loosely install the retaining screws.

8. Refer to Common Adjustments and Repairs (Part 10-1, Section 2) and perform the automatic choke spring housing adjustment.

into the choke shaft lever clevis nut, and turn the nut clockwise to thread the rod onto the nut.

PART 10-6—Autolite Model 4300 4-V Carburetor

1 DESCRIPTION AND OPERATION

DESCRIPTION

The Autolite Model 4300 4-V Carburetor (Figs. 1, 2 and 3) is a three-piece, separately cast design consisting of the air horn, main body and throttle body.

A cast-in center fuel inlet has provision for a supplementary fuel inlet system. The fuel bowl is vented by an internal balance vent, and a mechanical atmospheric vent operates during idle.

An idle air by-pass system is designed to provide a more consistent idle and a hot idle compensator is used to help idle stability.

The main (primary) fuel system has booster-type venturis cast integral with the air horn and the main venturis are cast integral with the main body. The secondary throttle plates are mechanically operated from the primary linkage. Air valve plates are located above the secondary main venturis and an integral hydraulic dashpot dampens sudden movement of the air valve plates to help prevent flutter and erratic engine operation. A single fuel bowl supplies both the primary and secondary fuel systems. Pontoon-type floats are used to help cornering and hill climbing capability. The accelerator pump is of the piston type located in the fuel bowl.

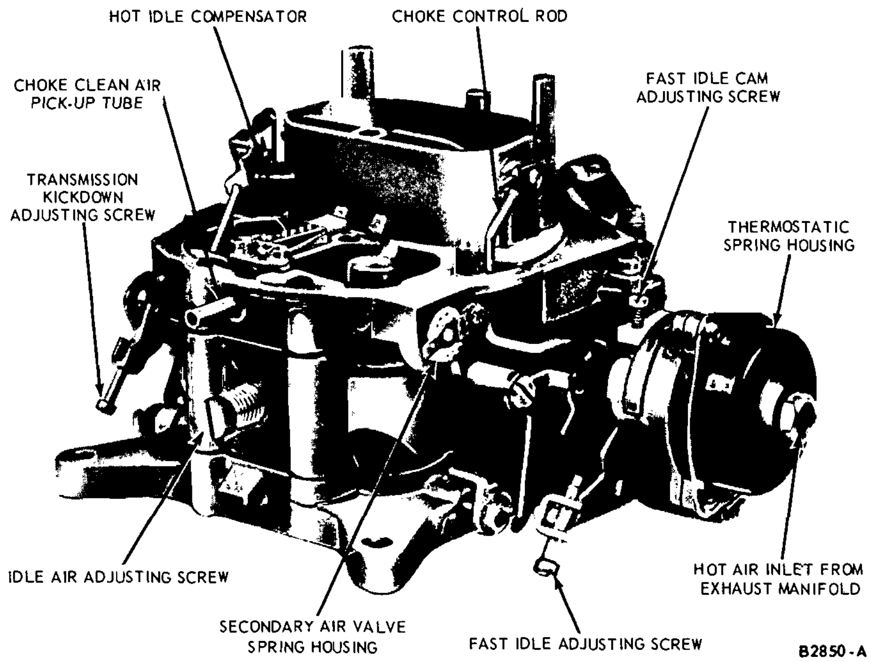


FIG. 1—Autolite Model 4300 4-V Carburetor—Right Rear 3/4 View

OPERATION

FUEL INLET SYSTEM

The fuel inlet system (Fig. 4) maintains a predetermined quantity of fuel (fuel level) within the carburetor. The correct fuel level is important for proper carburetor operation. A fuel level below the specified setting will result in lean fuel-air mixtures, while high fuel levels, produce rich fuel-air mixtures. The calibration of the carburetor is upset if the fuel level is not to specifications.

Fuel enters the carburetor through the fuel inlet channel located in the air horn. A needle valve and seat regulates the quantity of fuel flowing into the fuel bowl located in the main body. The quantity of fuel is regulated by the distance the needle valve is moved off the seat and by fuel pump delivery (volume and pressure). Correct fuel pump delivery is necessary if the specified fuel level within the carburetor is to be maintained.

The fuel level within the carburetor, is maintained at a predetermined level by a dual pontoon float and lever assembly, which controls the movement of the needle valve. The float reacts to any lowering in the fuel level. The needle riding on the float lever, falls away from the seat as the float drops due to a lower fuel level. To prevent fuel starvation during hot fuel vapor handling, an auxiliary fuel inlet valve opens to supplement the main fuel inlet valve. The auxiliary valve opens when the float drops below a predetermined level. The float lever presses against the auxiliary valve plunger, opening the valve for additional fuel to enter the fuel bowl.

The fuel bowl is vented internally by two stand pipes located adjacent to the choke air horn. In addition, a mechanically actuated valve, vents the fuel bowl externally during periods of idle and part throttle operation. The

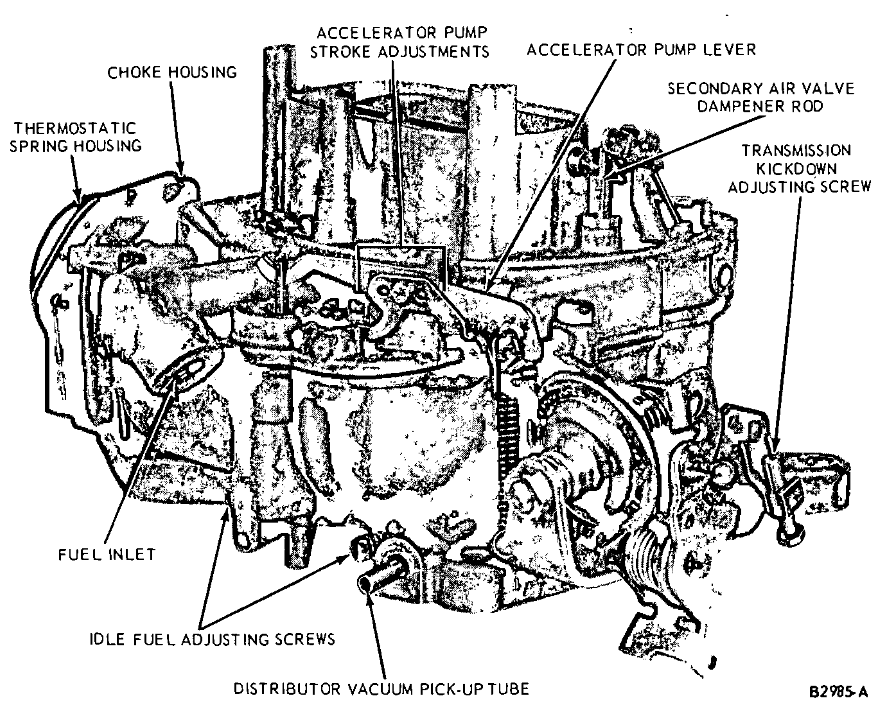


FIG. 2—**Autolite Model 4300 4-V Carburetor—Left Front 3/4 View**

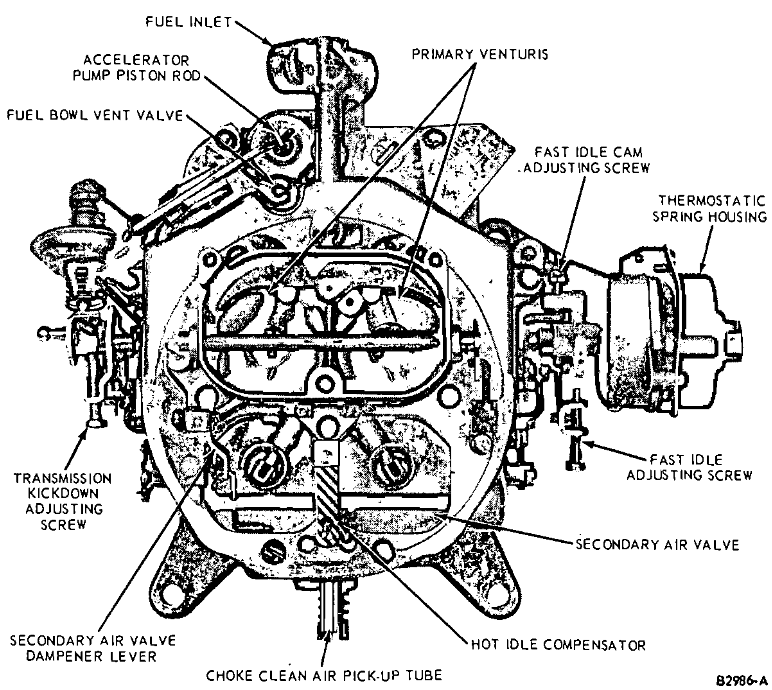


FIG. 3—**Autolite Model 4300 4-V Carburetor—Top View**

accelerator pump link controls the movement of the external vent valve.

The fuel inlet system has three main calibrating adjustments: float level, auxiliary fuel inlet and the external vent valve. The dual pontoons must be parallel for proper operation.

IDLE FUEL SYSTEM

The primary idle fuel system (Fig. 5) functions when the engine is operating at low engine rpm. It supplies the fuel-air mixture when the air flow past the carburetor venturi is insufficient to operate the main metering system. Air bleeds, restrictors and adjustments are provided to control and meter the idle fuel-air mixture.

At curb idle speeds, the throttle plates are completely closed and with manifold vacuum below the plates, enough difference in pressure is created between the fuel bowl and the idle discharge ports to operate the idle fuel system.

Fuel is forced from the fuel bowl through the main metering jets into the main well. The fuel then flows up through a calibrated restriction in the idle tube. Filtered air enters an idle air bleed restriction and mixes with the fuel flowing up the idle tube. The idle air bleed also serves as an anti-syphoning vent at high engine speeds or when the engine is shut down. The fuel-air mixtures passes down the idle channel into an idle cavity in the throttle body. The idle cavity has an upper and lower discharge port. At curb idle (throttle plate closed), the idle fuel-air mixture flows past an idle fuel adjusting screw and is discharged below the throttle plate from the lower discharge port and from a small portion of the upper discharge port.

The upper discharge port is a vertical slot-type port and extends slightly below the closed throttle plate. When opening the throttle plate, a greater portion of the upper discharge port is exposed to manifold vacuum and a larger amount of idle fuel-air mixture will discharge from the upper port. Further opening of the throttle plate results in a decrease in manifold vacuum and a decrease in the quantity of idle fuel-air mixture that is discharged. As the idle system tapers off, the main fuel metering system begins to discharge fuel.

The idle speed (engine rpm) is adjusted by turning an idle air adjusting screw to admit more or less air, as required, below the throttle plates. This method of air control by-passes the throttle plates. Filtered air enters through a pick-up hole located near the base of the main venturi. The air passes by the idle air adjusting screw and down into the throttle body. The air is then discharged from a port below the throttle plate.

It is particularly important that the idle air and the idle fuel mixture adjustments are performed at the same time. Opening the idle air screw to increase engine rpm leans the fuel-air mixture, consequently, the idle fuel mixture must also be increased to

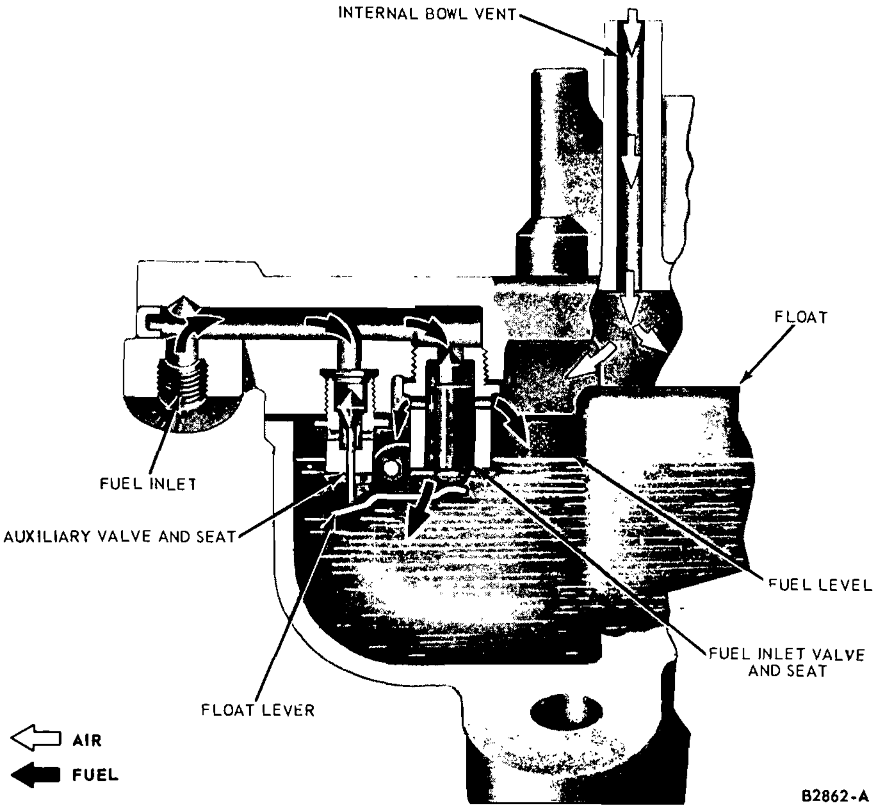


FIG. 4—Fuel Inlet System

provide the proper fuel-air mixture for smooth engine idle.

MAIN METERING SYSTEM

The main fuel metering system (Fig. 6) is calibrated to supply a leaner fuel-air mixture than the other fuel metering systems. This is because the main fuel metering system operates during a cruise or part throttle condition and under low engine power load requirements.

Main system calibration is controlled by calibrated main metering jets, high speed air bleeds and the fuel level in the fuel bowl.

The system begins to function when the air flow through the carburetor venturi creates a sufficient pressure drop (vacuum) to start fuel flow in the main system. The pressure drop at the main discharge nozzle in the booster venturi will increase, as the air flow through the carburetor increases. When engine speeds increase, the fuel flow in the main system will increase.

Fuel flows from the fuel bowl through calibrated main metering jets into a main well. The height of the fuel in the main well is controlled by the fuel level in the fuel bowl. Air is channeled down into the main well from a high speed air bleed, located in the air horn. Fuel is mixed with this air, which enters through holes in the main well tube. The fuel-air mixture flows up the tube and over to the discharge channel and is then discharged into the air stream flowing past the discharge nozzle in the booster venturi.

The high speed air bleed also serves as a vent to prevent syphoning of fuel at low speeds and as an anti-percolation vent during hot engine shut down.

ACCELERATOR PUMP SYSTEM

For smooth acceleration, the accelerator pump system (Fig. 7) injects a metered amount of fuel directly into the air stream flowing through the

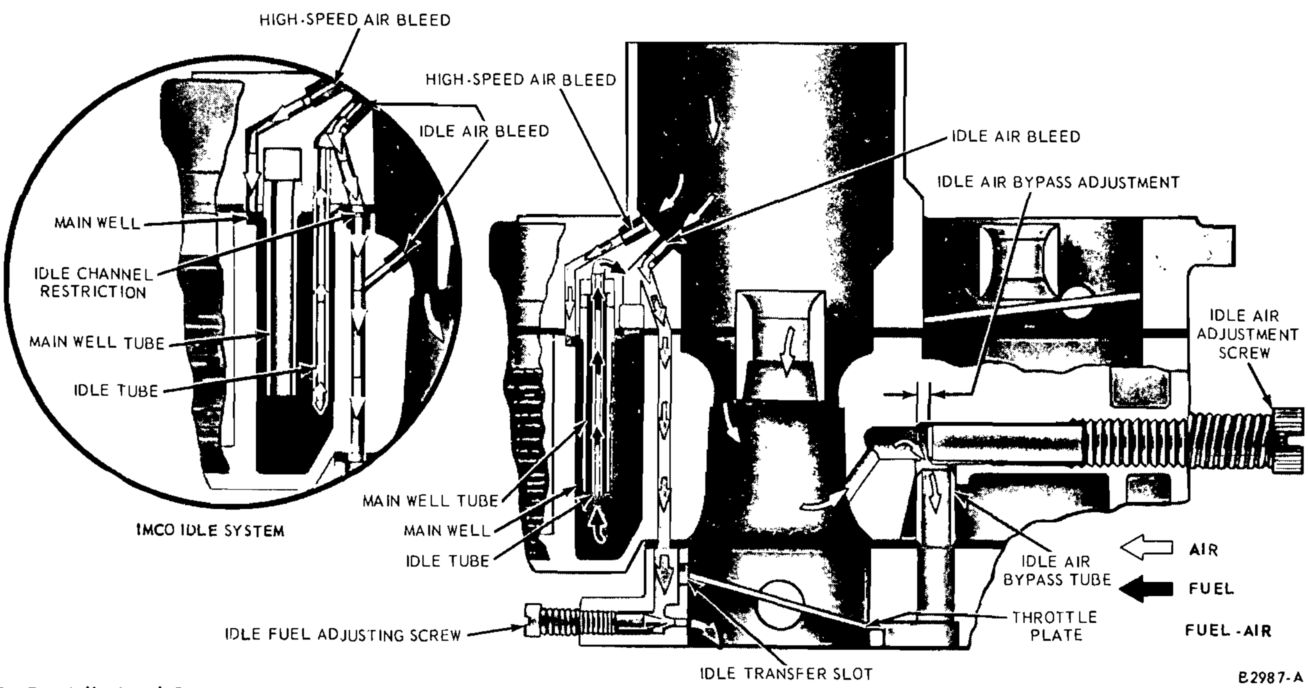


FIG. 5—Idle Fuel System

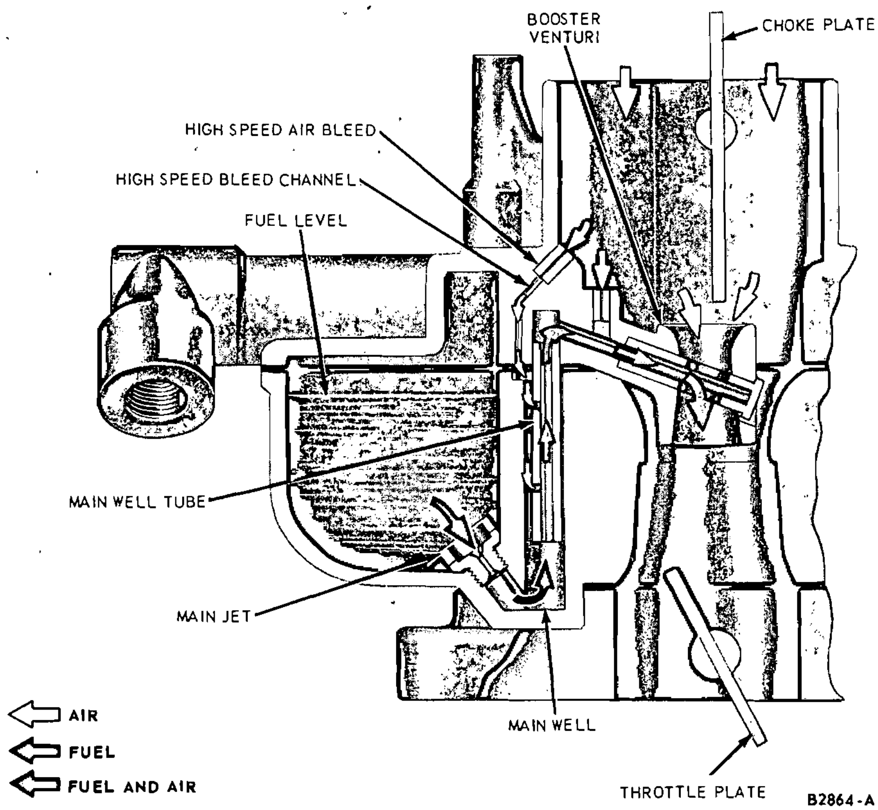


FIG. 6—Main Metering System

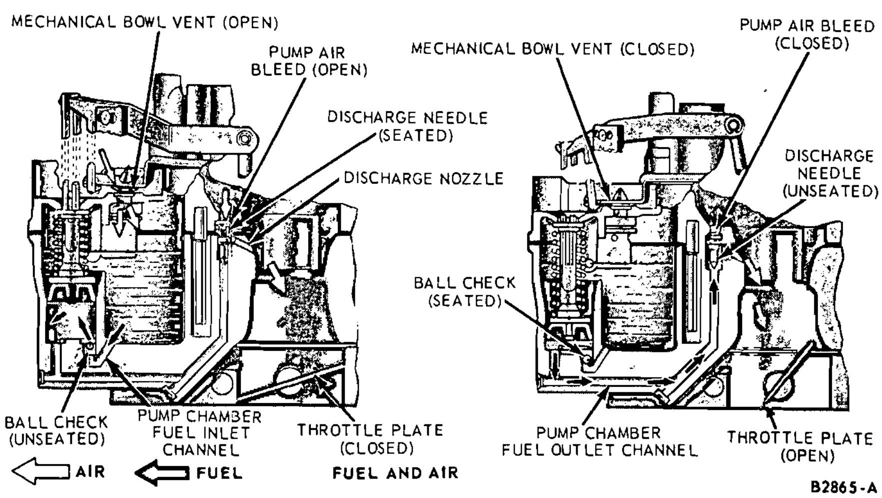


FIG. 7—Accelerator Pump System

carburetor. This fuel supplement is required for a brief period to compensate for a fuel lag that occurs in the idle or main fuel system when the throttle plates are suddenly opened. The air, which is lighter than fuel, responds almost immediately to any opening of the throttle plates.

When the throttle is closed, the accelerator pump plunger is pulled upward, compressing the accelerator pump spring. Fuel flows from the fuel bowl, past the intake ball check valve and into the pump chamber. The pump discharge valve needle is seated at this time to prevent air from being drawn into the pump chamber. When the throttle is opened, the spring loaded pump plunger moves downward, forcing fuel into the discharge channel and simultaneously forcing the inlet ball check to seat, thus preventing fuel from being forced back into the fuel bowl. The pressure of the fuel in the discharge channel unseats the discharge needle and the fuel flows through restrictions at the discharge nozzle outlets.

During high speed operation, a vacuum exists at the discharge nozzles. To prevent fuel from being drawn through the system, the discharge nozzles are vented by a check valve disc located in the cavity between the discharge nozzles and the pump discharge needle. This allows air instead of fuel to be drawn through the discharge nozzles.

POWER FUEL SYSTEM

During periods of increased engine road load operation, the fuel-air ratio must be increased for added power. Additional fuel is supplied during this period by the power fuel system (Fig. 8).

The power fuel system is piston actuated and controlled by manifold vacuum. A stem on the piston contacts the power valve in the lower main body. The piston assembly and the power valve are both spring loaded and oppose each other. However, the spring tension on the piston assembly is greater, therefore, piston position controls the power valve position.

Manifold vacuum, sensed through slots in the base of the throttle body, is transmitted through a passage in the main body to the power valve vacuum chamber, located in the upper body assembly.

At normal engine power demands, the high manifold vacuum draws the piston upward in the power valve vacuum chamber. With the piston in its uppermost position, the piston stem does not contact the power valve stem and the valve is thus normally closed.

During high power demands, a greater load is placed on the engine and manifold vacuum drops. When manifold vacuum drops below a predetermined value, the vacuum in the power valve piston chamber is reduced and the piston moves downward due to force applied by the vacuum piston spring. As the piston moves downward, the stem on the piston contacts the stem on the power valve. Continued downward movement of the piston opens the power valve. When the power valve is opened, fuel flows through the valve and into the connecting main fuel wells to supply the additional fuel required to meet the engine power demands.

When engine demands are reduced, manifold vacuum increases and the higher vacuum in the power valve vacuum chamber pulls the piston upward. As the piston moves upward the force exerted by the spring in the power valve closes the valve, shutting off the additional supply of fuel to the main wells.

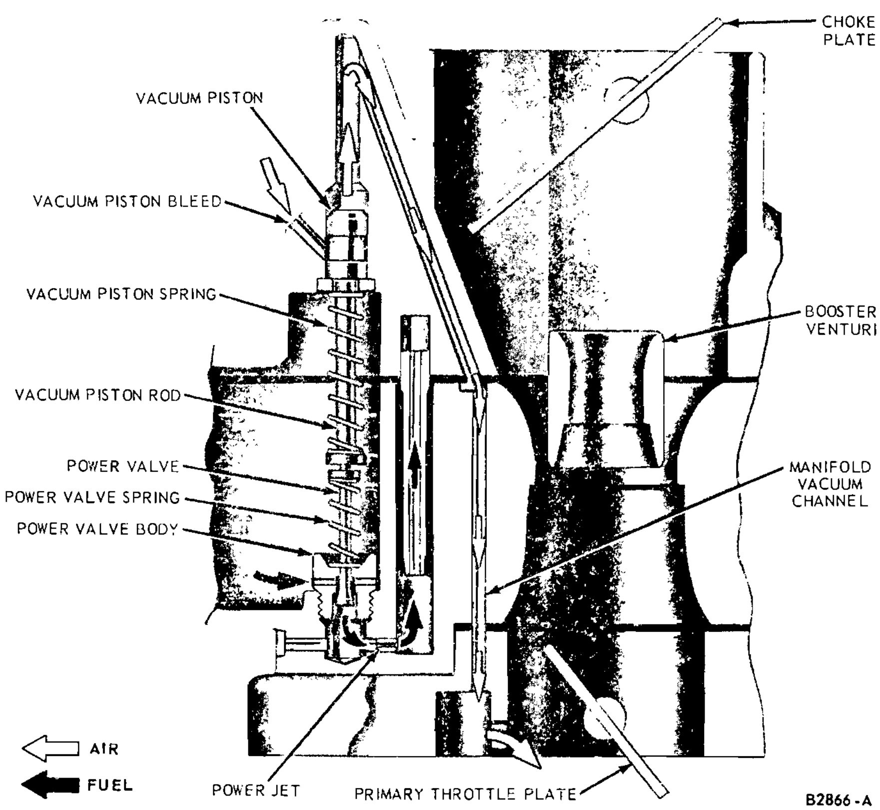


FIG. 8—Power Fuel System

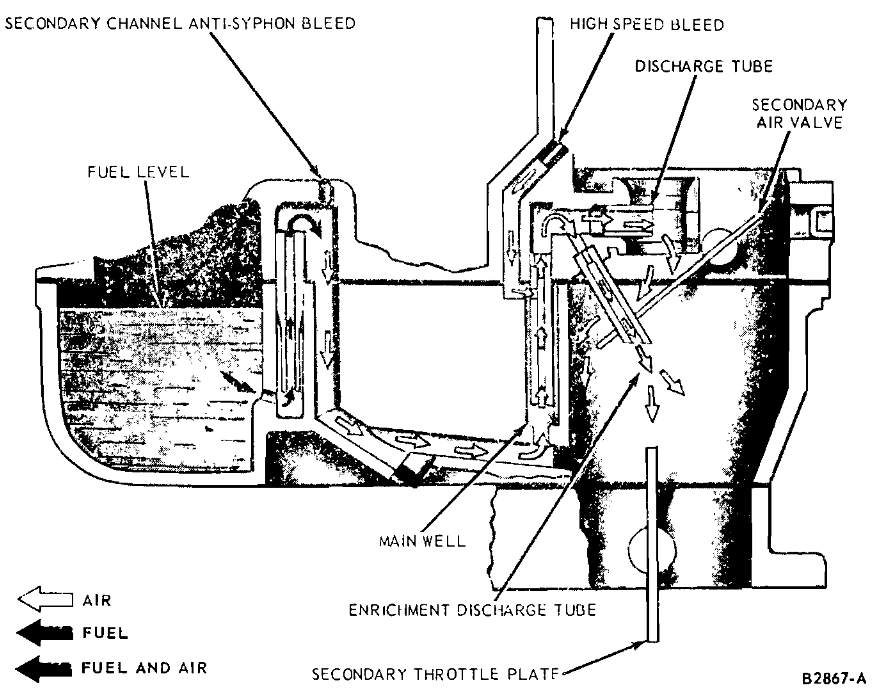


FIG. 9—Secondary Metering System

SECONDARY METERING SYSTEM

To provide a sufficient quantity of the fuel-air mixture to operate the engine at maximum power, the mixture supplied by the main fuel system is supplemented by an additional quantity of fuel-air mixture from the secondary fuel system (Fig. 9).

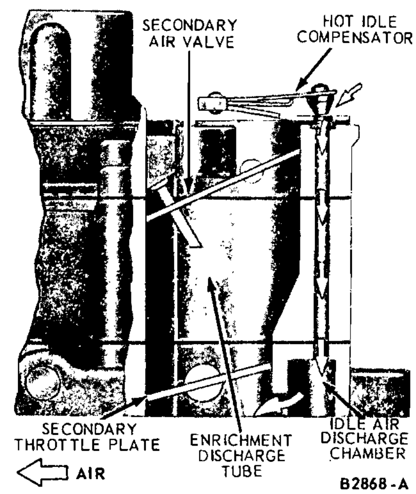


FIG. 10—Hot Idle Compensator

The secondary throttle plates are mechanically connected to the primary throttle lever. The secondary throttle plates begin to open when the primary throttle are 3/4 open and the engine warmed sufficiently to disengage the secondary throttle lock-out lever. The secondary throttle lock-out prevents the secondary throttles from opening during cold engine wide open throttle operation. Off-set air valve plates are located above the secondary main venturis and below the booster venturis. A calibrated coil spring pre-loads the air valve plates to a closed position.

When the secondary throttle plates begin to open, manifold vacuum appears below the air valve plates. Enrichment discharge tubes, located in the secondary main venturis, sense the pressure drop and fuel starts to flow in the secondary fuel system. The air valve plates also react to the pressure drop and start to open. The amount of opening is controlled by the velocity of air acting upon the off-set plates and the opposing torque exerted by a spiral torsion spring. In addition, an integral hydraulic dashpot dampens sudden movements of the air valve plates to help prevent plate flutter and erratic engine operation.

Fuel flows from the fuel bowl up through the secondary main jet tube. The fuel flows past the secondary channel anti-syphon bleed, located in the primary air horn, and down through a passage to the secondary main wells. The fuel flowing up the main well tubes is mixed with air from the high speed air bleeds and the fuel-air mixture is initially discharged from the enrichment discharge tubes. As the air flow through the secondaries increases, a greater pressure drop occurs in the booster

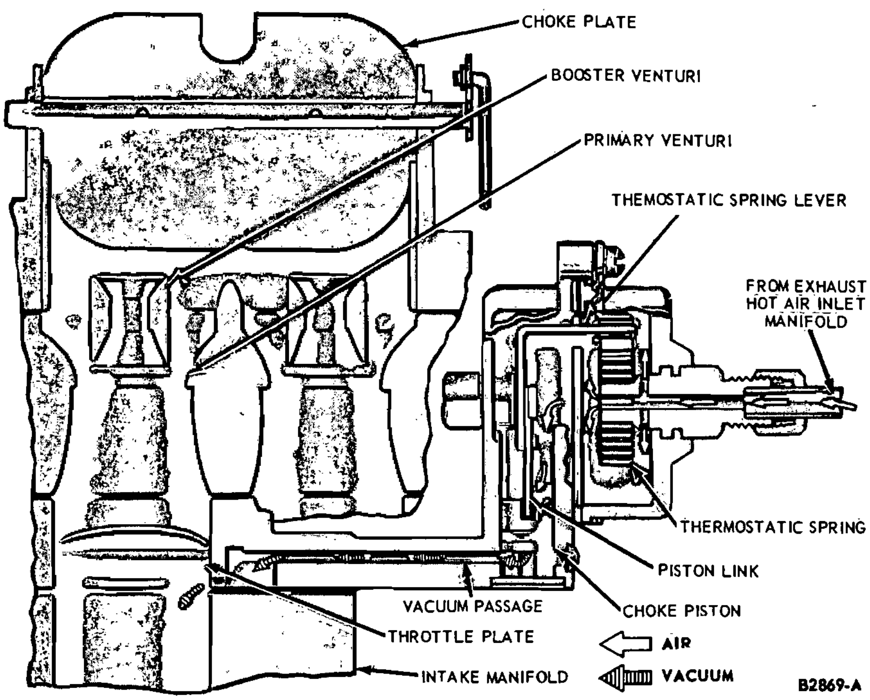


FIG. 11—Automatic Choke System

venturis and the fuel-air mixture is then discharged from the secondary main discharge tubes. The anti-syphon bleed and the high speed air bleeds act as anti-percolator vents during idling periods and when a hot engine is shut down. This helps vent fuel vapor pressure in the main well tubes before fuel is pushed out through the nozzles.

When the primary throttle plates begin to close on deceleration, the secondary throttle plates are closed mechanically. As air flows through the secondaries diminishes, the air valves are closed by force exerted by the air valve spring.

HOT IDLE COMPENSATOR

A thermostatically controlled hot idle compensator (Fig. 10) is located in the upper main body on the secondary side of the carburetor. At carburetor high inlet temperatures, the hot idle compensator will open and additional air is mixed with the idle fuel-air mixture.

The air enters through the compensator valve and moves down the air horn and main body passage into the idle air discharge chamber of the throttle body. The air is discharged below the throttle plates. The additional air improves idle stability and minimizes the excessively rich idle mixture resulting from increased fuel vaporization of a hot engine.

AUTOMATIC CHOKE SYSTEM

In order to start and operate a cold engine, a richer fuel-air mixture must be introduced into the cold intake manifold. The need for a richer fuel-air mixture is due to condensation of the atomized fuel inside the cold manifold. As the engine warms up, the atomized fuel inside the warm manifold can vaporize and a leaner fuel-air mixture is then required. The automatic choke system (Fig. 11) provides the function of regulating the enrichment of the fuel-air mixture during the start and warm-up period of cold engine operation.

Exhaust heated air is used to control automatic choke operation. Air is drawn from the pickup tube, located in the carburetor upper body assembly, and a heater in a chamber on the exhaust manifold. The heated air is then routed into the automatic choke cover and deflected around a bimetallic spiral torsion spring which controls the position of the choke plate relative to engine temperature. The air is exhausted below the throttle plates after passing through restrictions in the vacuum piston chamber.

When the engine is cold, the torque exerted by the bimetallic spring forces the choke linkage to close the choke plate.

As the engine starts, air velocity against the offset choke plate causes the choke plate to open slightly. Manifold vacuum, applied to the choke piston, pulls the piston downward and further assists in opening the choke plate. The choke plate opens to a position where the tension from the thermostatic spring is balanced by the air velocity acting on the choke plate and the pull of vacuum on the piston. Enough air is drawn around the choke plate to prevent engine flooding and to enable the engine to operate. The piston initial pull-down travel is limited by vacuum by-pass slots in the piston cylinder wall and a slot in the piston. When the slot in the piston is exposed to the slots in the cylinder wall, vacuum travels through the channel and further downward movement of the piston is restricted. The choke plate then, is opened to a definite distance, but no farther.

When engine reaches its normal operating temperature, the bimetallic spring exerts torque to hold the choke plate open.

If the engine is accelerated during the engine warmup period, the drop in manifold vacuum applied to the choke piston allows the thermostatic spring to partially close the choke plate for a brief moment. This action provides a richer fuel-air mixture to prevent engine stumble or stalls.

If the engine should flood (over rich mixture) during the starting period, the choke plate may be opened manually to lean out the excessively rich fuel-air mixture in the intake manifold. This is accomplished by fully depressing the accelerator pedal and engaging the starter. A projection on the throttle lever contacts the unloader face on the fast idle cam and, in turn, partially opens the choke plate.

During the engine warm-up period, it is necessary to provide a faster idle speed to prevent engine stalling. A fast idle cam is rotated into position by the automatic choke lever. A fast idle adjusting screw on the throttle lever contacts the cam face to provide the increased engine speed that is required.

2 REMOVAL AND INSTALLATION

REMOVAL

Flooding, stumble on acceleration, and other performance complaints are, in many instances, caused by the presence of dirt, water, or other foreign matter in the carburetor. To aid in diagnosing the cause of a complaint, the carburetor should be care-

fully removed from the engine without removing the fuel from the bowl. The contents of the bowl may then be examined for contamination as the carburetor is disassembled.

1. Remove the air cleaner. Remove the bracket that secures the heater hose to the automatic choke. Remove the throttle cable from the throttle lever. Disconnect the distributor vacuum line, in-line fuel filter, choke clean air tube and the choke heat tube at the carburetor.

2. Remove the carburetor retaining nuts and lock washers; then remove the carburetor.

Whenever the carburetor is removed from the engine, care must be exercised to prevent damage to the throttle plates. The lower edges of the throttle plates project below the carburetor body whenever they are open.

INSTALLATION

1. Clean the gasket surface of the intake manifold and carburetor. Install a new gasket. Position the carburetor, then install the carburetor retaining nuts. To prevent leakage, distortion or damage to the carburetor body flange, snug the carburetor retaining nuts; then, alternately tighten the nuts in a criss-cross pattern to the specified torque.

2. Connect the choke heat tube, in-line fuel filter, choke clean air tube and the distributor vacuum line. Connect the throttle cable to the throttle lever and adjust the accelerating pump stroke (if necessary); the idle fuel mixture and idle speed, and the anti-stall dashpot (if so equipped). Install the air cleaner.

3 MAJOR REPAIR OPERATIONS

DISASSEMBLY

To facilitate working on the carburetor, and to prevent damage to the throttle plates, install carburetor legs on the base. If legs are unavailable, install four 5/16 x 2 1/2 inch bolts and 8 nuts; install nuts on the bolts, above and below the carburetor base.

Use a separate container for the component parts of the various assemblies, to facilitate cleaning, inspection, and assembly.

The following is a step-by-step sequence of operations for completely overhauling the carburetor. **However, certain components of the carburetor may be serviced without a complete disassembly of the entire unit.** Refer to Fig. 14 for parts identification.

AIR HORN

1. Remove the fuel inlet line from the fuel filter.

2. Remove the choke clean air pickup tube (if so equipped) from the air horn.

3. Remove the choke control rod retainer from the automatic choke lever. Separate the rod from the lever.

4. Remove the accelerator pump rod retainer from the pump rod. Separate the rod from the throttle lever.

5. Remove the air horn to fuel bowl retaining screws (one of the 11 screws also retains the fuel bowl external vent valve).

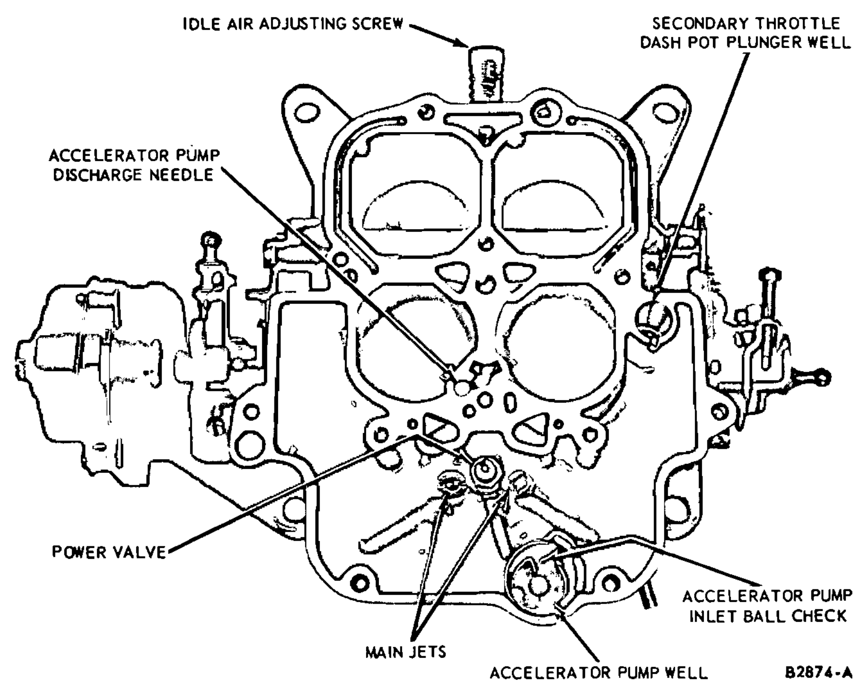


FIG. 12—Main Body Assembly

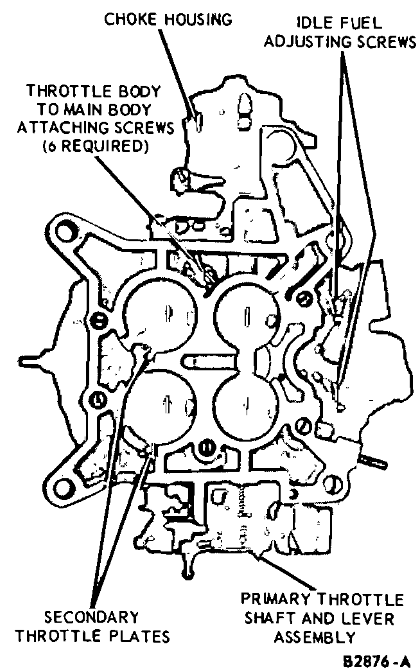


FIG. 13—Throttle Body—Bottom View

6. Lift the air horn off the main body.

7. Pull the float pivot pin and remove the float assembly.

8. Using the proper size screwdriver or jet removal tool, remove the main and auxiliary fuel inlet seats and gaskets.

9. Remove the secondary air valve lever retainer and the rod from the dampener piston assembly and air valve plate, then remove the air valve dampener piston and rod.

10. If it is necessary to remove the secondary air valve plates or shaft, scribe an index mark on the air valve housing and body casting. Re-

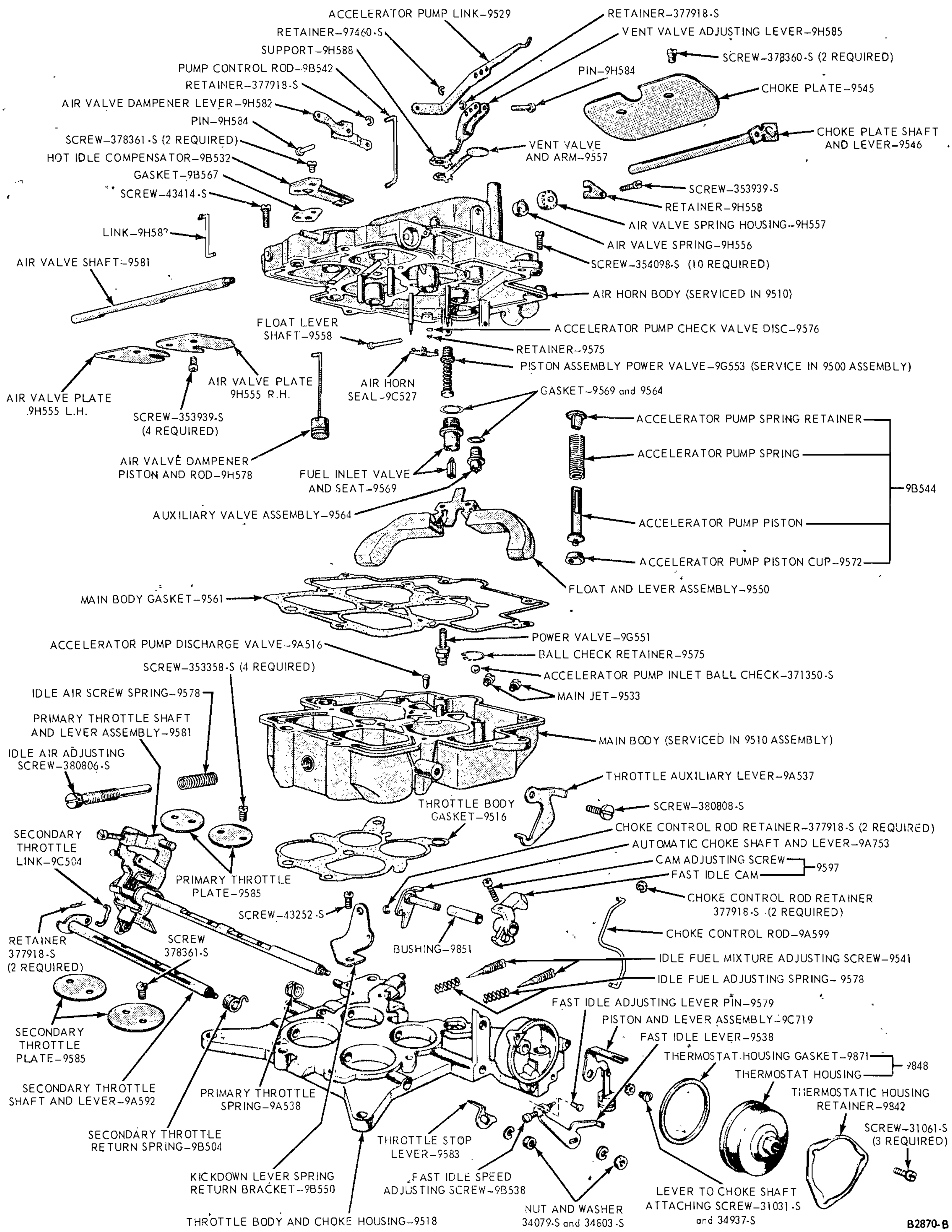


FIG. 14—Carburetor Assembly

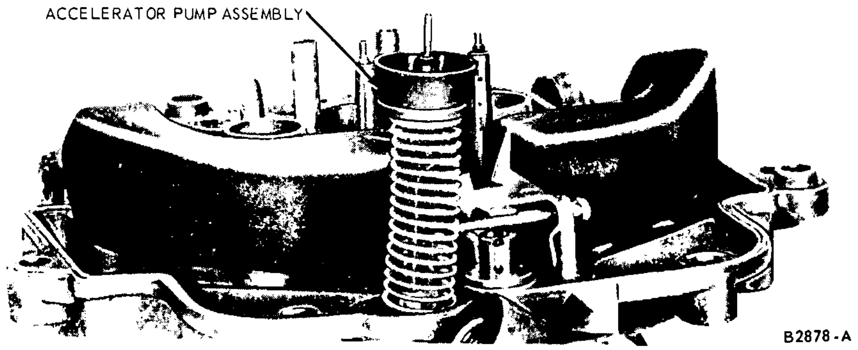


FIG. 15—Accelerator Pump in Position on Air Horn

move the air valve plate retaining screws. Remove the plates, then slide the shaft out of the air horn.

11. If it is necessary to remove the choke plate or choke shaft, remove the staking marks on the choke plate retaining screws and remove the screws. **If the tips of the screws are flared excessively, file the flared portion to prevent damage to the threads in the shaft.** Remove the choke plate, then slide the choke shaft out of the air horn.

12. Remove the hot idle compensator attaching screws, then remove the compensator.

13. **Do not remove the power valve vacuum piston assembly unless it is to be replaced. It is staked in place in the air horn, and care must be used to avoid damage to the air horn casting when relieving the staked areas.**

MAIN BODY

1. Turn the main body upside down and catch the accelerating pump discharge needle (Fig. 12).
2. Remove the idle air adjusting screw and spring.
3. With a 3/8 deep socket, remove the power valve from the floor of the main body fuel bowl (Fig. 12).
4. Remove the main metering jets (Fig. 12) from the fuel bowl with a jet tool.
5. Using long nose pliers, remove the accelerating pump inlet check ball retainer, then turn the main body over and catch the ball from the pump well.

THROTTLE BODY

1. Remove the throttle body to main body screws from the bottom of the throttle body (Fig. 13) and separate the two castings.
2. Remove the idle mixture screws and springs from the throttle body.
3. Remove the choke housing cover screws, cover, gasket and thermostatic spring.
4. Remove the choke piston lever retaining screw, then remove the piston assembly.
5. Remove the retainers from the secondary throttle lever to primary throttle connecting link, then remove the link.
6. If it is necessary to remove the throttle plates or shafts from the throttle body, remove the staking marks on the throttle plate attaching screws. Remove the screws and remove the plates.
7. Remove the nut from the secondary throttle shaft, then remove the lockout lever and slide the shaft and return spring out of the throttle body.
8. Remove the nut from the primary throttle shaft and remove the fast idle lever and adjusting screw. Slide the throttle shaft and primary throttle shaft and lever assembly out of the throttle plate.
9. Remove the primary throttle lever assembly retainer, then slide the lever and springs off the shaft.
10. If it is necessary to remove the fast idle cam or bushing, carefully press the bushing out of the choke housing and bushing column. **The column may bend out of alignment or break without proper support to the column during bushing removal or installation.**

CLEANING AND INSPECTION

Refer to Part 10-1, Section 3 for the cleaning and inspection procedures.

ASSEMBLY

Make sure all holes in the new gaskets have been properly punched and that no foreign material has adhered to the gaskets. Gasket surfaces must be clean and flat and free of nicks or burrs.

The carburetor assembly is shown in Fig. 14.

THROTTLE BODY

1. If the throttle plates and shafts are removed, slide the primary throttle return spring (coiled clockwise) on the primary throttle shaft (flat milled) and slide the shaft into the primary shaft holes (mixture needle side of body).
2. Position the primary throttle plates (smaller diameter) in the primary bores with the ground flat edge of the plates facing up and towards the idle mixture needles. Install the plate retaining screws snug but not tight.
3. Rotate the throttle shaft to the closed position and tap the plate lightly with the end of a screw driver handle or similar tool, so that the plates are properly and fully seated in the throttle bores (when viewed with a light behind the plates, little or no light should be observed). Tighten the throttle plate screws.
4. Install the secondary throttle lock out lever.
5. Install the fast idle speed lever and adjusting screw.
6. If the fast idle cam and bushing were removed, insert the automatic choke shaft bushing through the choke housing. Position the fast idle cam between the choke housing and bushing column. Slide the bushing through the fast idle cam. Press the bushing in the choke housing and into the column. Clean the bushing with a 1/4-inch reamer.
7. Insert the automatic choke shaft and lever in the bushing.
8. Position the automatic choke piston in the choke cylinder and the lever on the automatic choke shaft. Install the retaining screw.
9. Insert the secondary throttle to primary throttle connecting rod into the throttle levers and install retainers.

MAIN BODY TO THROTTLE BODY

1. Position the main body on a working surface with the fuel bowl down.
2. Position the main body to throttle body gasket on the main body.
3. Position the throttle body on the main body and install the retaining screws.
4. Invert the main body and throttle body so the fuel bowl is upward.
5. Install the power valve and main jets in the main body.
6. Install the choke to throttle lockout lever.
7. Place the accelerator pump ball check in the pump inlet hole of the pump chamber. Install the ball check retaining ring. **The retaining ring must be installed with the tangs over the pump inlet hole as shown in Fig. 47, Part 1, Section 2.**

8. Place the accelerator pump discharge needle into the pump discharge cavity.

9. Install the idle air screw and spring. Turn the screw inward (clockwise) until it lightly seats. Backoff (counterclockwise) three and one-half (3-1/2) turns.

AIR HORN

1. Install the components removed from the air horn in the following order:

a. Power valve and gasket.

b. Main fuel inlet seat and gasket.

c. Auxiliary fuel inlet valve and gasket.

d. Hot idle compensator and gasket.

2. Assemble the accelerator pump plunger (Fig. 15) and insert into air horn.

3. Compress the pump plunger and insert accelerator pump arm into plunger stem.

4. Slide fuel vent valve lever on air horn and under pump lever.

Line up holes in both levers and insert pivot pin through the No. 1 hole in levers and the air horn casting (Fig. 15). Install retainer on pin.

5. If the choke plate and shaft were removed, slide the choke shaft through the holes in the air horn with the lever end of the shaft on the automatic choke side.

Insert the choke plate into the slot in the choke shaft and install the plate retaining screws snug but not tight.

6. Close the choke plate and gently tap the plate with the end of a screw driver or a similar tool to properly position the plate in the air horn.

Tighten and stake the plate retaining screws.

7. Insert a new choke control rod seal on the choke control rod.

Push seal into air horn and attach control rod end to choke shaft lever with retainer. **The seal must grip the ledge in the air horn at all four points to prevent unfiltered air from entering carburetor.**

8. If the air valve plates and shaft were removed, slide the shaft through the holes on the secondary side of the air horn and with the slotted end of the shaft in the air valve spring chamber.

Position the plain air valve plate in the air horn opening on the underside of the air horn and adjacent to the spring chamber.

Install the plate retaining screws snug but not tight.

Position the other air valve plate in the air horn opening with the eye retainer for the air valve control rod facing upward.

Install the plate retaining screws snug but not tight.

9. Close the air valve plates and lightly tap the plates with end of a screwdriver or similar tool to properly position the plates in the air horn.

Tighten and stake the plate retaining screws. Be sure the plates and shaft turn freely after assembly.

10. Insert the air valve spring in the slot at the end of the shaft. Push the spring to the bottom of the slot. **The spring must be installed with the outer hook at the bottom of the spring cavity when the air valve plates are vertical (open). The hook opening must face to the left.**

11. Install the housing retainer but do not tighten the attaching screw.

12. Adjust air valve spring tension as described in Part 1, Section 2.

13. Insert fuel inlet needle into fuel inlet seat.

14. Position float and lever assembly between hinge post and over fuel inlet valves.

Insert float hinge pin through post and float lever.

15. Insert key end of air valve dampener rod into keyed hole in the air valve lever.

Slide other end of rod into eye on the air valve plate.

Position the air valve dampener lever on the air horn and install pivot pin and retainer.

16. Insert the air valve dashpot piston rod through air horn and attach the rod end to the air valve lever.

17. Insert the accelerator pump bleed disc into the pump bleed cavity.

Push disc retainer into cavity.

18. Set float levels (Refer to Common Adjustments and Repairs, Part 1, Section 2).

AIR HORN TO MAIN BODY

1. Position the main body to air horn gasket on the main body.

2. Carefully position the air horn assembly over the main body. Guide the accelerator pump plunger and the secondary throttle dashpot piston into their chambers as the air horn is gently lowered into position.

3. Install the longest of the 11 air horn retaining screws in the left rear hole.

4. Slide the fuel bowl vent valve into position under the accelerator pump lever. Position the vent valve support on the vent valve arm and install the retaining screw.

5. Install the other air horn retaining screws.

6. Insert the key end of accelerator pump control rod into the keyed hole in the primary throttle lever. Insert the other end of the rod into the pump lever and install retainer.

7. Insert the choke control rod end into the automatic choke lever. With long nose pliers, install the retaining clip.

8. Check the choke plate pulldown clearance (Refer to Part 1, Section 2).

9. Install the choke gasket cover and retainer. Set the cover to the ninety (90) degree rich position.

10. Check the fast idle cam clearance (Refer to Part 1, Section 2).

11. Reset the choke cover to specifications.

12. Check the fuel bowl vent valve clearance (Refer to Part 1, Section 2).

13. Remove the carburetor legs or bolts from the throttle body.

PART 10-7— Holley Model 4150 4-V Carburetor

1 DESCRIPTION AND OPERATION

DESCRIPTION

The fuel inlet system contains an external fuel distribution tube that routes fuel from the primary fuel inlet to the secondary fuel inlet.

The primary fuel bowl is vented during curb and off-idle engine operation through a vent valve, actuated by a lever on the throttle shaft.

The carburetor (Figs. 1, 2 and 3) is mounted on a spacer located on the intake manifold. The carburetor is installed in the normal manner with the primary throttle and fuel bowl facing toward the front of the engine.

The carburetor can be considered as two dual-carburetors; one supplying a fuel-air mixture throughout the entire range of operation (primary stage), and the other functioning only when a greater quantity of fuel air mixture is required (secondary stage).

The primary stage of the carburetor contains a fuel bowl, fuel bowl vent, metering block and an accelerating pump assembly. The primary power system or power valve is located within the primary metering block. The primary barrels each contain a primary and booster venturi, main fuel discharge nozzle, throttle plate and an idle fuel passage. The choke plate, mounted on the air horn above the primary barrels, is controlled by an automatic choke mechanism.

The secondary stage of the carburetor contains the secondary fuel bowl, metering block and the secondary throttle operating diaphragm assembly. The secondary barrels each contain a primary and booster venturi, idle fuel passages, a transfer system, a main secondary fuel discharge nozzle and a throttle plate.

FUEL INLET SYSTEM

A separate fuel inlet system is provided for the primary and secondary stages. The fuel first enters the primary fuel bowl through a filter screen and then into the fuel inlet needle and seat assembly. A fuel tube at the fuel inlet connects both fuel bowls. The fuel inlet system for the primary and secondary system operates the same.

The amount of fuel entering the fuel bowl is regulated by the distance the fuel inlet needle is lowered off its seat, and by fuel pump pressure. Movement of the fuel inlet needle in relation to the seat is controlled by the float and lever assembly which rises and falls with the fuel level. As the fuel level drops, the float drops, lowering the fuel inlet needle from its seat to allow fuel to enter the fuel bowl.

When the fuel in the fuel bowl reaches a pre-set level, the float raises the fuel inlet needle to a position where it restricts the flow of fuel, admitting only enough fuel to replace that being used. The fuel inlet system must maintain the pre-set level, because the basic metering systems are calibrated to deliver the proper

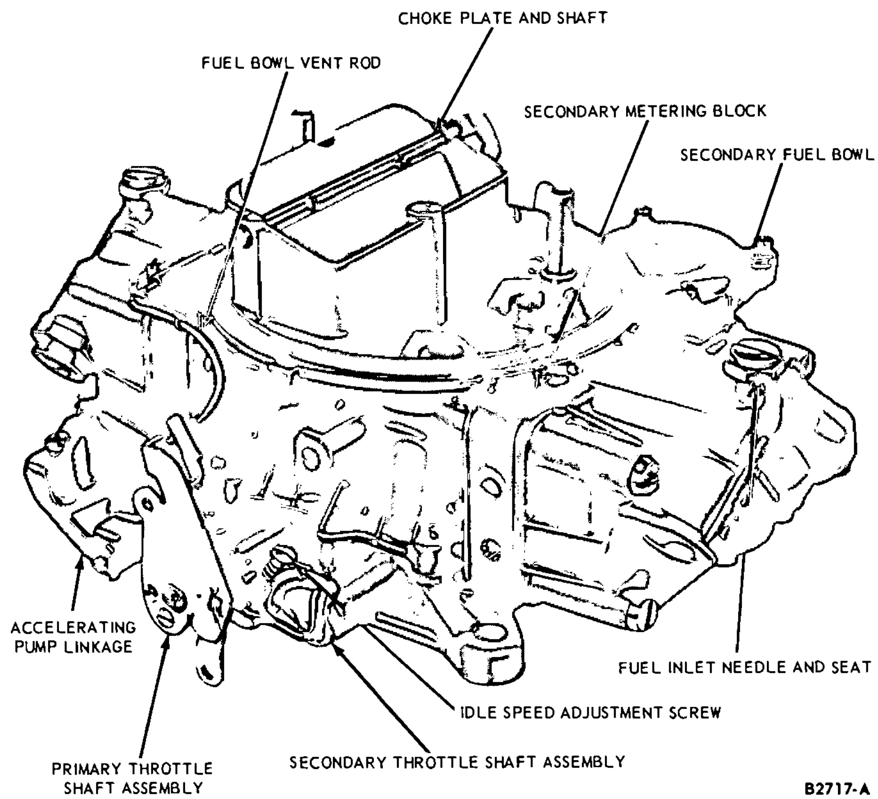


FIG. 1—Left Rear View—Holley Model 4150 4-V

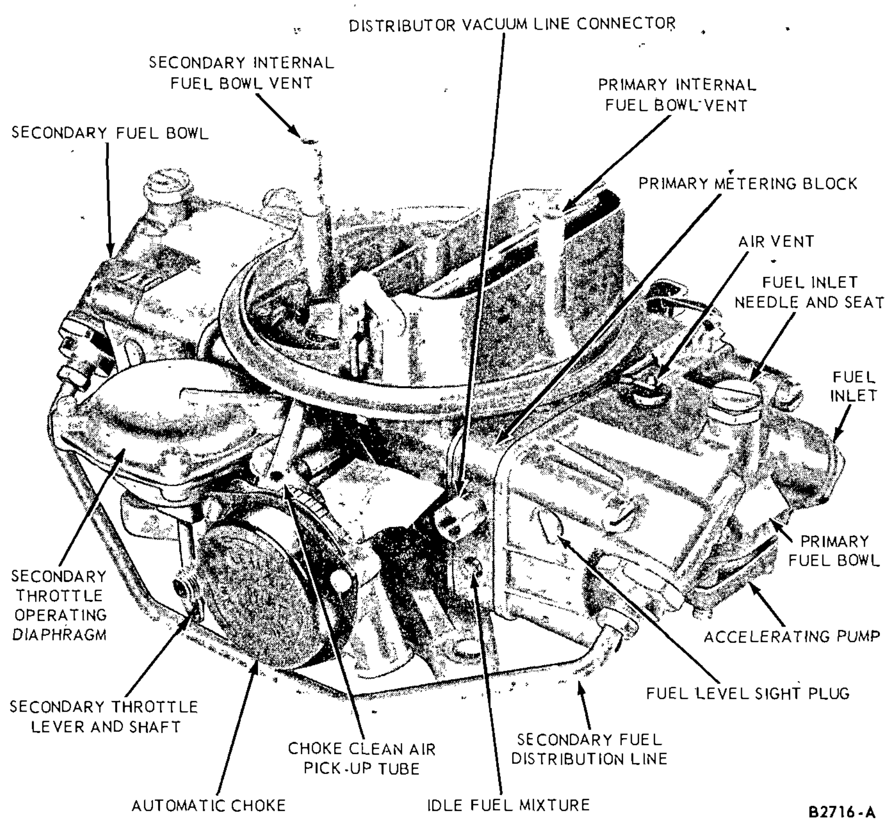


FIG. 2—Right Front View—Holley Model 4150 4-V

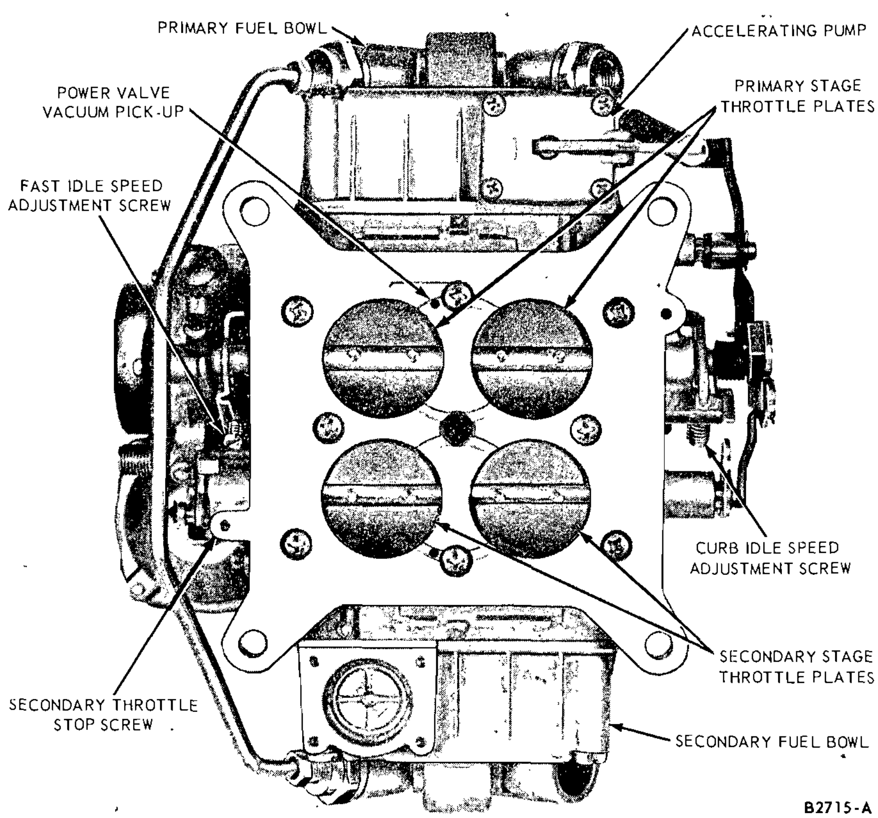


FIG. 3—Bottom View—Holley Model 4150 4-V

fuel mixture only when the fuel is at the proper level. A spring, located under the float, assists in keeping the float stable.

The fuel bowls are internally vented by the vent tube *at all times*. In addition, the primary fuel bowl is externally vented by an air vent located at the top of the bowl. The external vent provides a release of excess fuel vapors from the bowl.

The balance tube, which connects the primary and secondary fuel bowls, balances the air pressure between the two bowls.

AUTOMATIC CHOKE SYSTEM

The choke plate, located in the air horn above the primary barrels, when closed, provides a high vacuum above as well as below the throttle plates. With a vacuum above the throttle plates, fuel will flow from the main fuel system as well as from the idle fuel system. This provides the rich fuel mixture required for cold engine operation.

The carburetor choke shaft is linked to a thermostatic choke control mechanism mounted on the main body (Fig. 4).

The automatic choke is equipped with a bi-metal thermostatic spring and a vacuum piston. The bi-metal thermostatic spring mechanism winds up when cold and unwinds when warm. When the engine is cold, the thermostatic spring, through attaching linkage, holds the choke plate in a closed position. Manifold vacuum, channeled through a passage in the choke control housing, draws the choke vacuum piston downward, exerting an opening force on the choke plate. When the engine is started, manifold vacuum acting directly on the piston located in the choke housing, and the flow of air acting on the offset choke plate immediately moves the plate against tension of the thermostatic spring. This action partially opens the choke plate to prevent stalling.

As the engine continues to operate, manifold vacuum draws heated air from the exhaust manifold heat chamber. The amount of air entering the choke housing is controlled by restrictions in the air passages in the carburetor.

The warmed air enters the choke housing and heats the thermostatic spring, causing it to unwind. The tension of the thermostatic spring gradually decreases as the temperature of the air from the heat chamber rises, allowing the choke plate to open. The air is exhausted into the intake manifold.

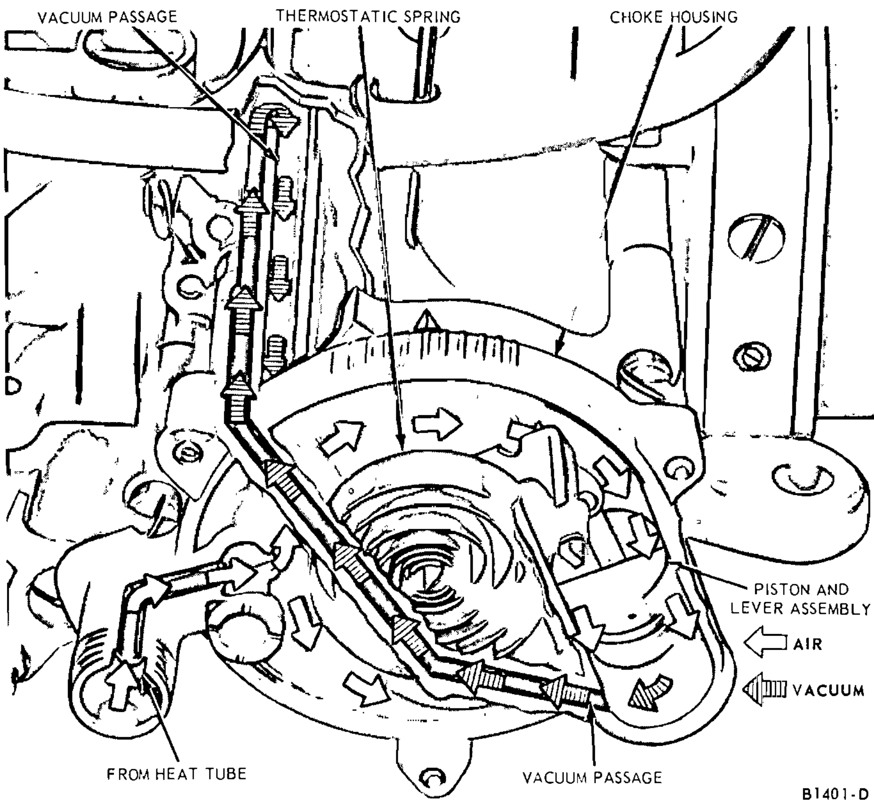


FIG. 4—Typical Holley 4-V Automatic Choke System

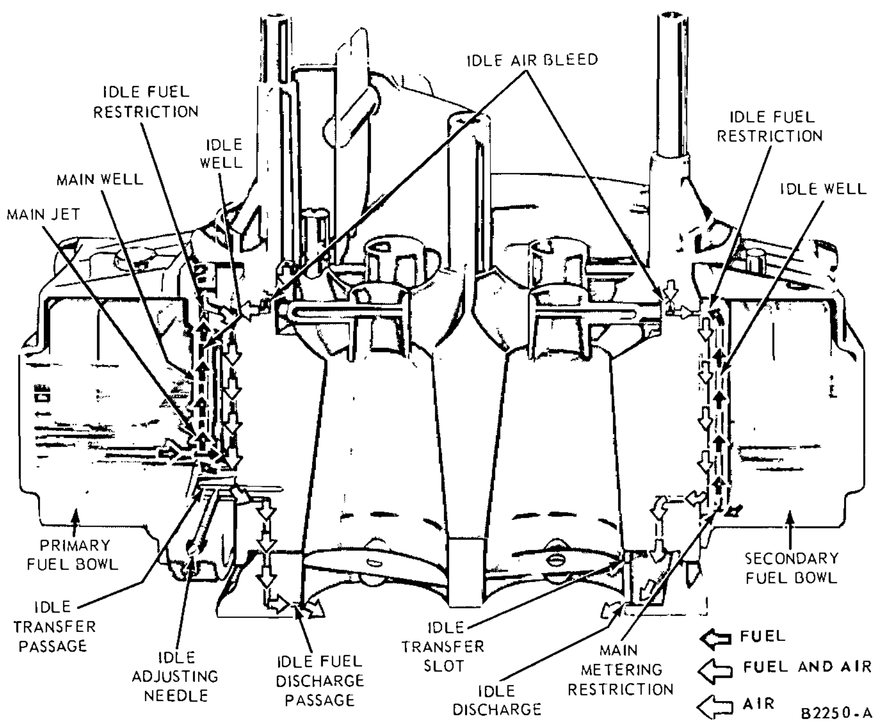


FIG. 5—Typical Holley 4-V Idle Fuel System

When the engine reaches its normal operating temperature, the thermostatic spring no longer exerts an opposing tension on the choke piston, allowing the piston to pull the choke plate to the full open position. In this position, the choke piston is at its lowest point in the cylinder. Slots in the piston chamber will allow sufficient air to bleed past the piston and into the intake manifold, causing a continual flow of warm air to pass through the thermostatic spring housing. The spring thus remains fully open until the engine is stopped and allowed to cool.

The choke rod actuates the fast idle cam during choking. Steps on the edge of the fast idle cam contact the fast idle adjusting screw which permits a faster engine idle speed for smoother running when the engine is cold. As the choke plate is moved through its range of travel from the closed to the open position, the choke rod rotates the fast idle cam. Each step on the fast idle cam permits a slower idle rpm as engine temperature rises and choking is reduced.

During the warm-up period, if the engine should reach the stall point due to a lean mixture, manifold vacuum will drop considerably. The tension of the thermostatic spring then overcomes the lowered vacuum acting on the choke piston, and the choke plate will be moved toward the closed position, providing a richer mixture to prevent stalling.

The linkage between the choke lever and the throttle shaft is designed so that the choke plate will partially open when the accelerator pedal is fully depressed. This permits unloading of a flooded engine.

IDLE FUEL SYSTEM

Since the idle fuel system for the primary and secondary carburetor operate in the same manner, only one carburetor is discussed.

At idle and low speed operation, the engine does not draw sufficient air through the primary booster venturi to create a vacuum great enough to operate the main metering system; therefore, an idle fuel system is provided which is not dependent upon venturi-vacuum to discharge fuel.

High manifold vacuum at idle creates a low pressure at the idle discharge port. The pressure in the fuel bowl is near atmospheric pressure. The difference in pressure between the fuel bowl and the idle discharge port forces fuel through the idle fuel system.

The carburetor has identical idle fuel systems (Fig. 5) for each primary barrel, and identical idle fuel systems for each secondary barrel. Idle fuel is discharged into both the primary and secondary barrels. Idle fuel for the primary barrels is drawn from the primary fuel bowl, and idle fuel for the secondary barrels is drawn from the secondary fuel bowl.

Fuel flows from the primary fuel bowl through the main jets into a

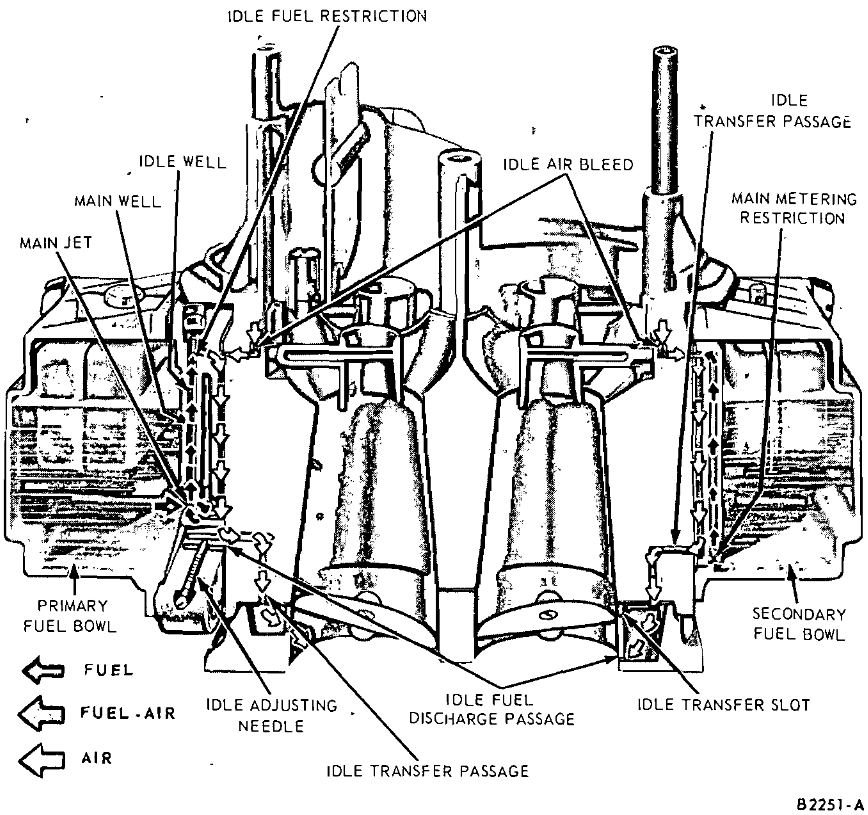


FIG. 6—Typical Holley 4-V Idle Transfer System

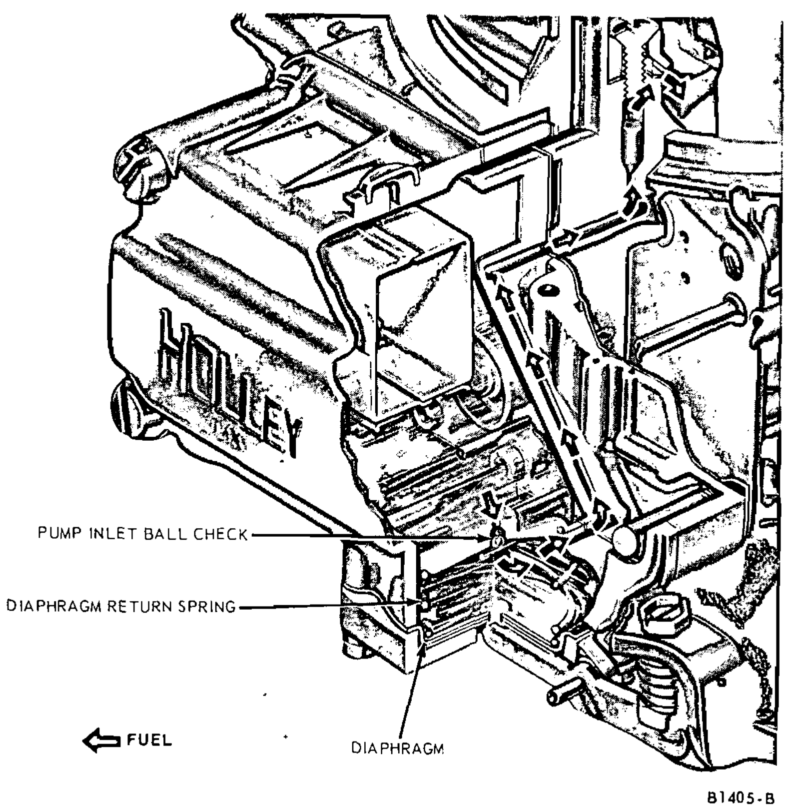


FIG. 7—Typical Holley 4-V Accelerating System

smaller angular passage (idle feed) that leads across to the idle well.

Fuel flows from the secondary fuel bowl through the main metering restrictions of the rear metering body and into the idle well. The fuel flows up the idle well, where it is mixed with air from the idle air bleeds.

PRIMARY STAGE

After leaving the idle well, the fuel-air mixture flows through a short horizontal passage and then down another vertical passage. At the bottom of this vertical passage, the fuel-air mixture branches in two directions, one through the idle discharge passage and the other to the idle transfer passage (Fig. 6).

The fuel in the idle discharge passage flows past the idle adjusting needle which controls the fuel discharge at idle. From the idle adjusting needle chamber, the fuel goes through a short passage in the main body and down another passage into the throttle body. The fuel is discharged below the throttle plate.

During off-idle operation when the throttle plate is moved slightly, the fuel flows through the idle transfer passage (Fig. 6) in the metering body and then into the main body through a restriction. From the main body, it flows into a passage in the throttle body. As the idle transfer slot is exposed to manifold vacuum, fuel is discharged.

As the throttle plate is opened still wider and engine speed increases, the air flow through the carburetor is also increased. This creates a vacuum in the booster venturi great enough to bring the main fuel system into operation. The flow from the primary stage idle fuel system begins tapering off as the main fuel system begins discharging fuel.

SECONDARY STAGE

After leaving the idle well or idle fuel passage, the fuel-air mixture flows through a short horizontal passage and then down another vertical passage. At the bottom of this passage, the fuel-air mixture flows through a short passage in the main body, and down another passage into the throttle body. The fuel is discharged below the closed throttle plate. A transfer slot acts as an air bleed at idle. The secondary idle fuel system continues discharging fuel until the secondary main fuel system comes into operation.

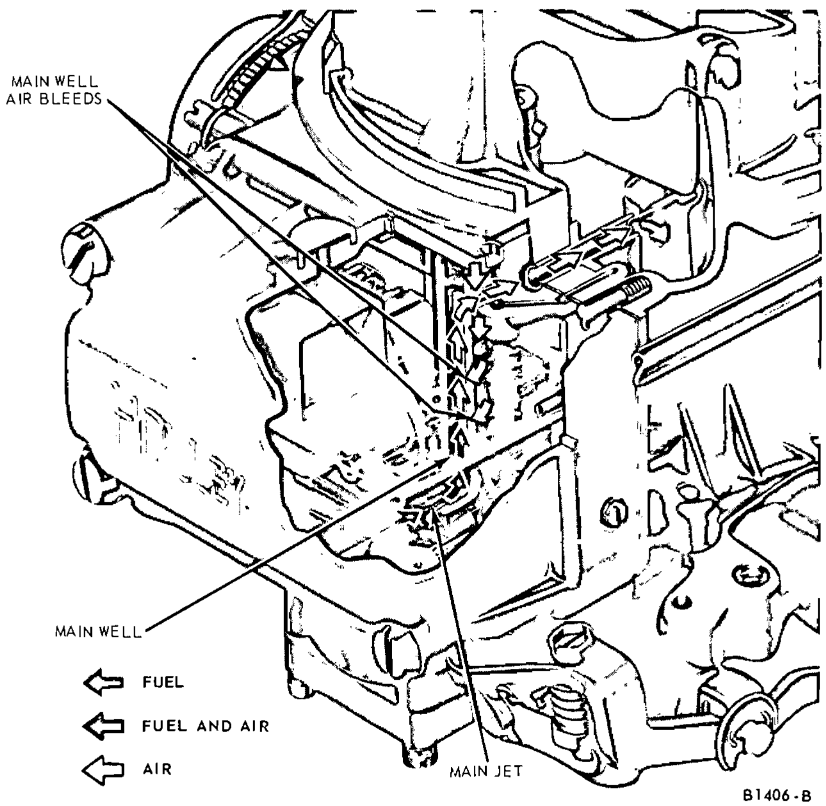


FIG. 8—Typical Holley 4-V Primary Stage Main Fuel System

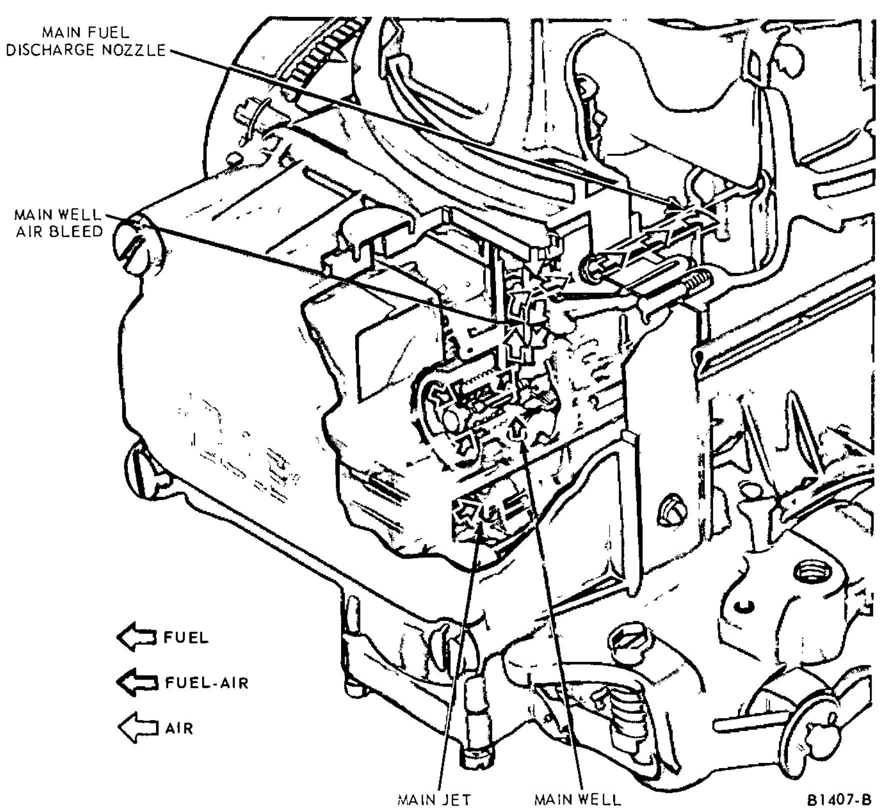


FIG. 9—Typical Holley 4-V Power Fuel System

ACCELERATING SYSTEM

The accelerating system for the primary and secondary carburetors operate in the same manner; therefore, only one carburetor is discussed.

Upon acceleration, the air flow through the carburetor responds almost immediately to the increased throttle opening. There is, however, a brief interval before the fuel, which is heavier than air, can gain speed and maintain the desired balance of fuel and air. During this interval, the accelerating pump supplies fuel until the other fuel systems can once again provide the proper mixture (Fig. 7).

The accelerating pump is located in the bottom of the primary fuel bowl. It begins to function when the pump operating lever is actuated by throttle movement. When the throttle is opened, the accelerating pump linkage, actuated by a cam on the primary throttle shaft, forces the pump diaphragm up. As the diaphragm moves up, the inlet ball check is forced onto its seat, preventing fuel from flowing back into the fuel bowl. The fuel flows from the short passage in the primary fuel bowl into the long diagonal passage in the primary metering block. The fuel passes into the main body and then into the pump discharge chamber. The pressure of the fuel raises the discharge needle and fuel is discharged into the venturi from the pump nozzle.

As the throttle is moved toward the closed position, the linkage returns to its original position and the diaphragm spring forces the diaphragm down. As the diaphragm returns to its original position, the pump inlet ball check is moved off its seat and the diaphragm chamber is filled with fuel from the fuel bowl.

PRIMARY STAGE MAIN FUEL SYSTEM

The primary stage main fuel system for the primary and secondary carburetors operate in the same manner, therefore, only one carburetor is discussed.

When the throttle plate is progressively opened, engine speed increases and the air passing through the booster venturi gradually creates sufficient vacuum to bring the main fuel system into operation and fuel will be discharged through the main discharge nozzle. The difference in pressure between the primary venturi and the fuel bowl causes fuel to flow through the primary stage main fuel system (Fig. 8).

The fuel moves up the main well past the main well air bleeds in the

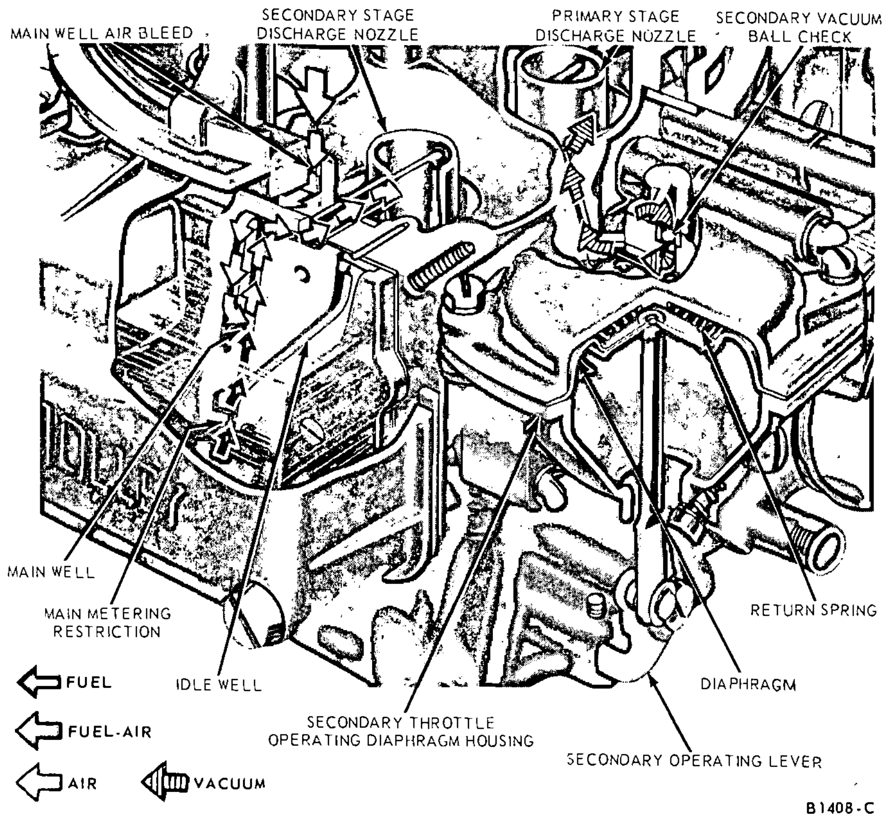


FIG. 10—Typical Holley 4-V Secondary Stage Main Fuel System

side of the well. Filtered air enters through the main air bleed in the main body and then into the metering block by interconnecting passages. This mixture of fuel and air, being lighter than raw fuel, responds faster to any change in venturi vacuum and atomizes more readily when discharged into the air stream of the venturi. The mixture of fuel and air moves up the main well passage in the metering block and passes into the short horizontal passage leading to the main body, then through the horizontal channel of the discharge nozzle. The fuel is discharged into the booster venturi where it is atomized and mixed with air flowing through the carburetor.

POWER FUEL SYSTEM

The primary power fuel systems for the primary and secondary carburetors operate in the same manner; therefore, only one carburetor is discussed.

During periods of increased road loads or high power operation, the carburetor has a tendency to lean out as the air flow is increased. To supplement the primary stage main fuel system, additional fuel is required to maintain the proper fuel-air ratio. The added fuel required during this period is supplied by the power fuel system (Fig. 9).

The power fuel system is controlled by manifold vacuum, which gives an accurate indication of the power demands placed on the engine. Manifold vacuum is highest at idle speed and decreases as the load on the engine is increased.

Manifold vacuum is transmitted from an opening in the base of the throttle body, through a passage in the throttle body, and main body to the power valve chamber in the primary metering block. The manifold vacuum, acting on the diaphragm at idle or normal load conditions, is strong enough to overcome the tension of the power valve spring and holds the diaphragm closed. When high power operation places a greater load on the engine and manifold vacuum drops below a predetermined value, the power valve spring overcomes the reduced vacuum and opens the power valve. Fuel flows through the power valve and through the diagonal restrictions in the metering block into the main well. In the main well, the fuel joins the fuel flow from the primary stage main fuel system, enriching the mixture.

As engine power demands are reduced, manifold vacuum increases. The increased vacuum overcomes the tension of the power valve spring and draws the valve diaphragm closed. This closes the power valve and shuts off the added fuel supply.

SECONDARY STAGE THROTTLE OPERATION AND MAIN FUEL SYSTEM

The secondary stage throttle operation and main fuel systems for the primary and secondary carburetors are the same in operation; therefore, only one carburetor is discussed.

The secondary stage of the carburetor is supplied with fuel from the secondary fuel bowl which receives its fuel through a connecting tube at the fuel inlet fitting on the primary fuel bowl. The secondary fuel inlet system operates the same as the primary fuel inlet system.

The secondary stage throttle plates are operated by a spring-loaded vacuum diaphragm assembly attached to the side of the main body and linked to the secondary throttle shaft (Fig. 10).

Opening of the secondary throttle plates is controlled by vacuum from the right primary and secondary venturis. At high speeds, when engine requirements approach the capacity of the two primary barrels, the increased primary venturi vacuum moves the secondary diaphragm, compressing the diaphragm spring. The diaphragm, acting through the diaphragm link and lever, starts to open the secondary throttle plates. The position of the throttle plates depends upon the strength of the vacuum. This, in turn, is determined by the air flow through the primary barrels. As the secondary throttle plates begin to open, the vacuum in the secondary barrels increases. The increased vacuum in the right secondary venturi assists the primary venturi vacuum in further opening the secondary throttle plates. As top speed is reached, the secondary throttle plates will approach wide open position.

The bleed past the ball check valve in the vacuum passage of the secondary diaphragm housing limits the rate at which the secondary throttle plates will open. Any rapid increases in vacuum, which would tend to open the secondary throttle plates too suddenly, merely holds the ball check valve securely against its seat. The opening of the throttle plates is slowed to a rate governed by the amount of air passing through an air bleed in the ball check valve seat. This allows the vacuum to build up slowly at the diaphragm, which results in a controlled rate of opening for the secondary throttle plates.

When engine speed is reduced, venturi vacuum in the bores becomes weaker. The momentarily stronger vacuum at the secondary throttle operating diaphragm moves the ball check valve off its seat in the vacuum passage, permitting an immediate flow of air into the diaphragm chamber. As the vacuum acting on the diaphragm is lessened, the load on the diaphragm spring will start closing the secondary throttle plates. The diaphragm spring is assisted by the design of the secondary plates. Each secondary plate is slightly off set. When the plates are closing, the combined force of manifold vacuum and the air stream has greater effect on the larger, upstream area of the plates, forcing them to a closed position. The secondary plates are retained in the closed position when primary plates are fully closed by the secondary throttle connecting rod. This rod, which is fastened to the primary throttle lever, rides in a slot in the secondary throttle lever.

A transfer slot or passage begins to function when the secondary throttle plates begin to open. As the plates begin to open, the fuel flows through the main metering restrictions into the transfer passages, which are similar to those in the primary metering block.

When the secondary throttle plates are opened further, the difference in pressure between the secondary booster venturis and the secondary fuel bowl causes the secondary main fuel system to begin discharging fuel. The passages in this system are similar to those in the primary main fuel system.

2 REMOVAL AND INSTALLATION

Flooding, stumble on acceleration, and other performance complaints are, in many instances, caused by the presence of dirt, water, or other foreign matter in the carburetor. To aid in diagnosing the cause of a complaint, the carburetor should be carefully removed from the engine without removing the fuel from the bowls. The contents of the bowls may then be examined for contamination as the carburetor is disassembled.

REMOVAL

1. Remove the air cleaner. Remove the throttle rod from the throttle lever. Disconnect the choke control heat tube and the fuel line at the carburetor.

2. Remove the carburetor retaining nuts and lockwashers; then remove the carburetor and mounting gasket. Remove the carburetor spacer and gaskets. Discard the gaskets.

INSTALLATION

1. Be sure all old gasket material is removed from the spacer. Install a new lower spacer gasket and the spacer on the intake manifold. Position the carburetor and a new gasket on the spacer.

Connect the choke heat tube, and fuel inlet line loosely to the carburetor. Install the carburetor retaining lock washers and nuts. Tighten the nuts evenly and alternately.

2. Tighten the choke heat tube and fuel line fittings at the carburetor. Connect the throttle rod. Refer to Common Adjustments and Repairs and adjust the engine idle speed, idle fuel mixture, fast idle speed and the anti-stall dashpot (if so equipped). Install the air cleaner.

3 MAJOR REPAIR OPERATIONS

DISASSEMBLY

To facilitate working on the carburetor(s), and to prevent damage to the throttle plates, install carburetor legs on the base. If the legs are unavailable, install four bolts, about 2 1/4 inches long of the correct diameter, and eight nuts on the carburetor base.

Use a separate container for the component parts of the various assemblies, to facilitate cleaning, inspection, and assembly.

The following is a step-by-step sequence of operations for completely overhauling the carburetor. However, certain components of the carburetor may be serviced without a complete disassembly of the entire unit. For a complete carburetor overhaul, follow all the steps. To partially overhaul the carburetor or to install a new gasket kit, follow only the applicable steps.

Refer to Fig. 18 for identification of the parts used on the Holley carburetor.

PRIMARY FUEL BOWL AND METERING BLOCK

1. Disconnect the inter-connecting fuel line at the primary and secondary fuel bowls. Remove the retaining screws and gaskets, fuel bowl and gasket and the metering block and gasket. Discard the gaskets. Remove the baffle.
2. Remove the idle adjusting screws from the metering block.
3. Using a jet wrench, remove the main jets (Fig. 11).
4. Using a socket wrench, remove the power valve and gasket (Fig. 12).
5. Remove the fuel level adjustment lock screw and gasket. Turn the adjustment nut counterclockwise and remove the lock nut and gasket. Remove the fuel inlet needle and seat assembly. **Do not disassemble the fuel inlet needle and seat. They are matched assemblies and are replaced as an assembly.**
6. Remove the screws securing the float assembly to the fuel bowl (Fig. 13). Remove the float assembly.
7. Slide the shaft out of the float assembly and remove the spring (Fig. 14).
8. Remove the fuel level sight plug and gasket. Remove the fuel bowl interconnecting fuel line fitting and gasket. Discard the gasket.
9. Remove the fuel inlet fitting, gasket, and filter screen.
10. Invert the fuel bowl and remove the accelerating pump cover, diaphragm, and spring. The accelerating pump inlet ball check is not removable.
11. Remove the vent rod bracket retaining screw and lockwasher. Remove the plug, spring and bracket from the vent rod.

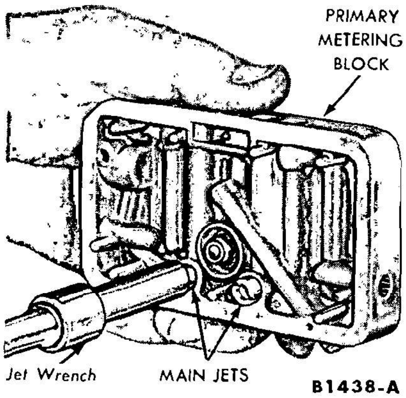


FIG. 11—Main Jet Removal or Installation—Holley 4-V

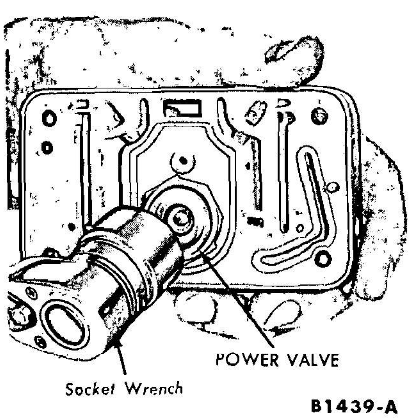


FIG. 12—Power Valve Removal or Installation—Holley 4-V

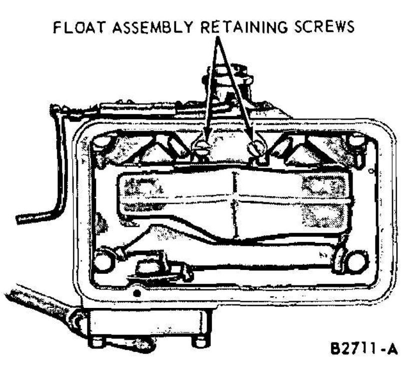


FIG. 13—Float Assembly Removal or Installation—Holley 4-V

SECONDARY FUEL BOWL AND METERING BLOCK

1. Remove the fuel bowl. Remove the metering block and the front and the rear gasket.

Disassemble the fuel bowl and the metering block by following Steps 3, 5, 6, 7 and 8 under Primary Fuel Bowl and Metering Block.

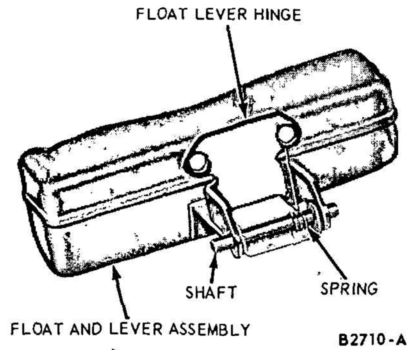


FIG. 14—Float Assembly—Holley 4-V

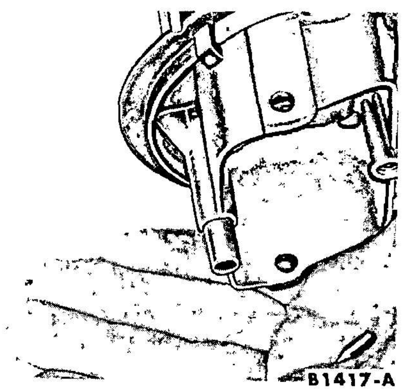


FIG. 15—Accelerating Pump Discharge Needle Removal—Holley 4-V

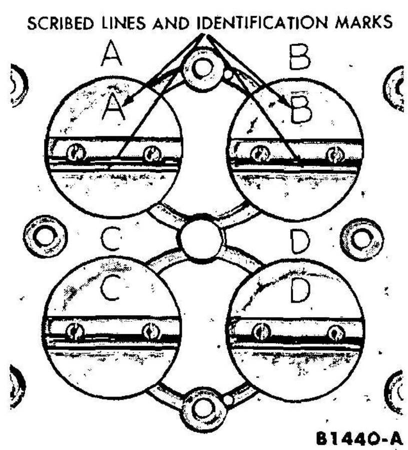


FIG. 16—Throttle Plate Removal—Holley 4-V

MAIN BODY

1. Remove the air cleaner anchor stud, and remove the secondary diaphragm operating rod to link retainer.

2. Invert the carburetor and remove the throttle body retaining screws and lock washers. Lift the throttle body and discard the throttle body gasket.

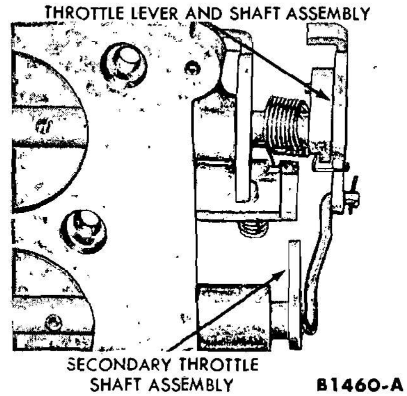


FIG. 17—Throttle Lever and Shaft Assembly Installation—Holley 4-V

Automatic Choke

1. Remove the choke rod retainer from the automatic choke housing shaft and lever assembly. Remove the thermostatic spring housing and gasket; then remove the choke housing and gaskets from the main body.

2. Remove the choke housing shaft nut, lock washer, and spacer, then, remove the shaft and fast idle cam. Remove the choke piston and lever assembly.

3. Remove the choke rod and seal from the main body. If necessary, remove the choke plate from the choke shaft; then slide the shaft and lever out of the air horn. The retaining screws are staked to the choke shaft. If the tips of the screws are flared excessively, file off the flared portion to avoid damage to the threads in the choke shaft. **Be careful not to damage the choke shaft or venturi while filing the screws.**

Secondary Diaphragm Housing

1. Remove the secondary diaphragm housing assembly and gasket from the main body. **The housing assembly must be removed before the cover can be removed.**

2. Remove the diaphragm housing cover; then, remove the spring and diaphragm, and the vacuum ball check from the housing.

Accelerating Pump Discharge Assembly.

1. Remove the accelerating pump discharge nozzle screw. Lift the pump discharge nozzle and gaskets out of the main body. Invert the main body and let the accelerating pump discharge needle fall into the hand (Fig. 15).

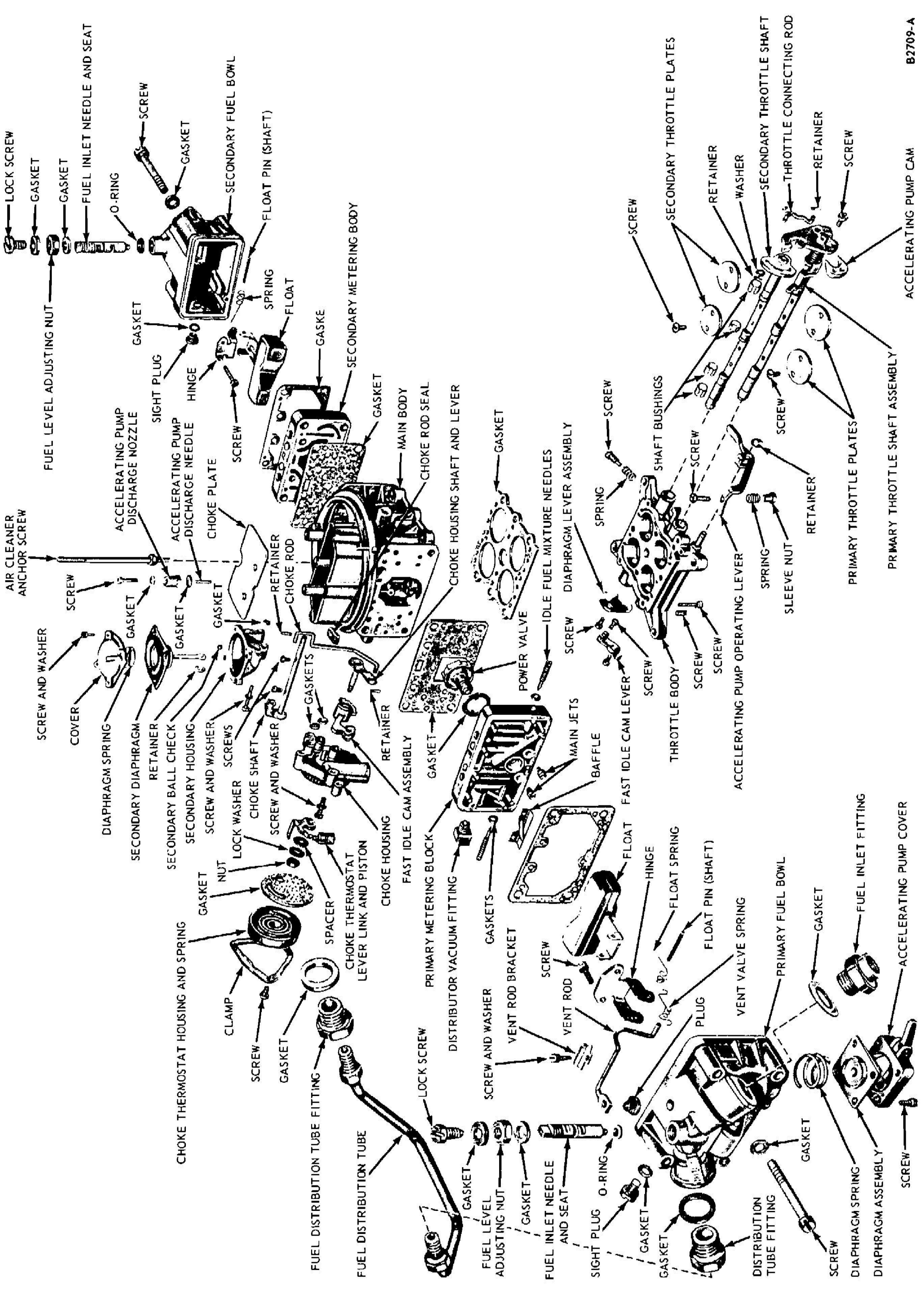


FIG. 18—Holley 4-V Carburetor Assembly

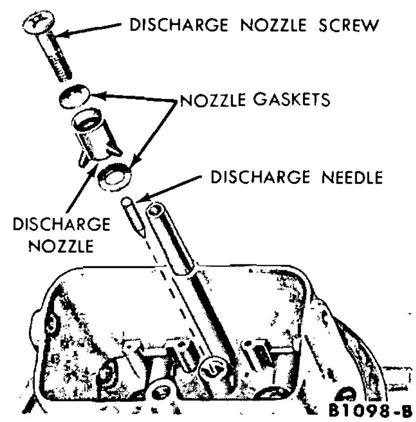


FIG. 19—Accelerating Pump Discharge Assembly—Holley 4-V

THROTTLE BODY

1. Remove the accelerating pump operating lever retainer.

2. Remove the secondary throttle connecting rod retainers and the connecting rod. Remove the secondary diaphragm lever and the fast idle cam lever retaining screws and washers, and remove the levers.

3. If necessary, remove the throttle stop screw.

4. If it is necessary to remove the throttle plates, lightly scribe the throttle plates along the throttle shaft, and mark each plate and its corresponding bore with a number or letter for proper installation (Fig. 16). Remove the throttle plates. The retaining screws are staked to the throttle shaft. **If the tips of the screws are flared excessively, file off the flared portion to avoid damage to the threads in the throttle shaft. Be careful not to damage the throttle shaft or venturi while filing the screws.**

Remove the primary throttle shaft return spring from the notch on the throttle shaft lever (Fig. 17). Slide the primary throttle lever and shaft assembly out of the throttle body. If necessary remove the accelerating pump cam.

Slide the secondary throttle shaft out the main body and remove the bushings from the shaft.

ASSEMBLY

Make sure all holes in the new gaskets have been properly punched and that no foreign material has adhered to the gaskets. Make sure the accelerating pump and secondary operating diaphragms are not cut or torn.

The carburetor assembly is shown in Fig. 18.

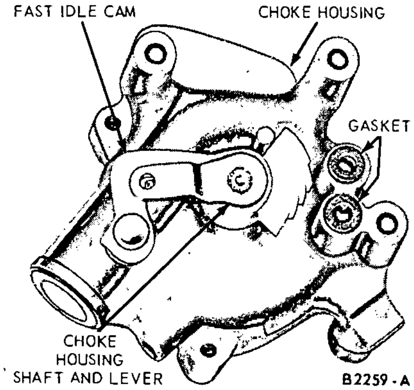


FIG. 20—Choke Housing Linkage Installed—Holley 4-V

THROTTLE BODY

Refer to Fig. 18 for the correct location of the parts.

1. If the secondary throttle plates were removed, position the bushings on the secondary throttle shaft. Slide the shaft into the throttle body. Refer to the lines scribed on the throttle plates; then, install the plates in their proper location with the screws snug, but not tight.

Close the throttle plates and hold the throttle body up to the light. Little or no light should show between the throttle plates and the throttle bores. If the throttle plates are properly installed and there is no binding when the throttle shaft is rotated, tighten the throttle plate screws. Stake the screws. **When staking the screws, support the shaft and plates on a block of wood or a soft metal bar to prevent bending of the shaft.**

Refer to Common Adjustments and Repairs for the correct adjustment of the secondary throttle plates.

2. Install the secondary diaphragm lever, lock washer, and screw.

3. Install the accelerating pump cam on the primary throttle shaft if it was previously removed. Place the throttle connecting rod end with the smallest bend into position in the primary throttle lever. Slide the throttle shaft into the throttle body, guiding the throttle connecting rod so that the other end fits into the secondary throttle lever.

4. Position the primary throttle return spring so that the small tang fits into the slot in the throttle lever and the long tang rests against the slot in the throttle body stop (Fig. 17).

5. Install a washer on the secondary throttle shaft end of the connecting rod; then secure both ends of the connecting rod with hairpin type retainers.

6. Install the primary throttle plates, using the same procedures as for the secondary throttle plates.

7. Install the fast idle cam lever, lock washer, and screw.

8. Install the throttle stop screw.

9. Install the accelerating pump operating lever and retainer.

MAIN BODY

Accelerating Pump Discharge Assembly

1. Drop the accelerator pump discharge needle into its well (Fig. 19). Lightly seat the needle with a brass drift and a hammer.

2. Position the accelerating pump nozzle and gaskets in the main body and install the retaining screw.

Secondary Diaphragm Housing

1. **The secondary diaphragm housing must always be installed before the choke housing.** Drop the vacuum ball check in the vacuum port of the secondary diaphragm housing; then, position the secondary diaphragm in the housing and place the spring in the cover (Fig. 18).

2. Install the cover with the screws finger-tight. Pull the diaphragm rod downward as far as it will go and tighten the cover screws. **The diaphragm housing must always be removed from the main body to install the cover.**

3. Place the gasket on the secondary vacuum passage opening on the main body. Place the diaphragm housing in position on the main body and install the lock washers and retaining screws.

Automatic Choke

1. Position the choke plate shaft in the air horn and install the choke plate in the shaft (Fig. 18). Install the rod seal on the choke rod. Slide the U-shaped end of the choke plate rod through the opening in the main body and insert the rod end through the inner side of the bore in the choke lever. The rod end must face outward. Push the rod seal into the retaining grooves on the underside of the air cleaner mounting flange.

2. Position the choke thermostat lever link and piston assembly in the choke housing. Position the fast idle cam assembly on the choke housing and install the choke housing shaft and lever assembly (Fig. 20). Position the lever and piston assembly on the choke housing shaft and lever assembly. Install the spacer, lock washer and nut.

3. Lay the main body assembly on its side and position the choke housing gaskets on the main body. Insert the choke rod in the choke housing shaft lever as the choke housing is placed in position on the main body. **Be sure the projection on the choke rod is placed under the fast idle cam so that the cam will be lifted when the choke plate is closed.** Install the choke housing lock washers and screws. Using needle-nose pliers, install the choke rod cotter pin.

4. Place the thermostatic spring housing gasket in position on the choke housing, engaging the thermostatic spring on the spring lever; then, install the housing, clamp and screws. Adjust the thermostatic spring housing by aligning the index mark on the cover with the mid-position mark on the choke housing.

Main Body To Throttle Body

1. Invert the main body and position the throttle body gasket on the main body. Place the throttle body on the main body and slide the secondary diaphragm rod onto the secondary operating lever as the throttle body is placed into position. Install the throttle body to main body retaining screws and lock washers.

2. Secure the secondary diaphragm rod with the retainer.

3. Install the air cleaner anchor stud.

PRIMARY FUEL BOWL AND METERING BLOCK

1. Place the accelerating pump diaphragm spring and diaphragm in the accelerating pump chamber. The diaphragm must be positioned so that the large end of the lever disc will be against the operating lever. Install the cover with the screws finger-tight. Make sure the diaphragm is centered, then, compress the diaphragm with the pump operating lever and tighten the cover screws.

After the carburetor is assembled, refer to Common Adjustment and Repair for the correct adjustment of the accelerating pump.

2. Install the filter screen, gasket and fuel inlet fitting.

3. Install the fuel level sight plug and gasket. Install the fuel bowl interconnecting fuel line fitting and gasket.

4. Install the plug in the fuel bowl vent rod. Position the spring on the vent rod. Install the vent rod assembly and bracket on the fuel bowl and install the retaining screw.

5. Position the float hinge bracket on the float arm and install the float shaft and spring (Fig. 14). Secure the float assembly to the fuel bowl with the retaining screws (Fig. 13).

6. Apply petroleum jelly to a new O-ring seal and slide it on the fuel inlet needle and seat assembly.

7. Position the fuel inlet needle and seat assembly in the fuel bowl through the top of the bowl. Position the adjusting nut gasket and nut on the fuel inlet needle and seat assembly. Align the flat on the I.D. of the nut with the flat on the O.D. of the fuel inlet needle and seat assembly. Install the fuel level adjustment lock screw and gasket.

8. As a preliminary float adjustment, refer to Common Adjustments and Repairs and perform the Float Adjustment—Dry procedure (Part 10-1).

9. Using a socket wrench, install the power valve and gasket in the metering block (Fig. 12). **Be sure to install the specified power valve. Refer to the specifications for the correct identification number. The number is stamped on a flat on the base of the valve.**

10. Using a jet wrench, install the specified jets in the metering block (Fig. 11).

11. Install the idle adjusting needles. Turn the idle adjusting needles in until they just touch the seat; then, back them off the specified number of turns for an initial idle fuel mixture adjustment.

12. Position the metering block gasket on the dowels located on the back of the metering block.

Position the metering block and gasket on the main body. Position the baffle plate (primary side only) and the gasket on the metering block. Place the retaining screws and new compression gaskets in the fuel bowl. Position the bowl in place on the metering block while making certain the fuel bowl vent rod is properly positioned against the primary throttle lever. **Make sure the accelerating pump lever adjusting screw rests on the lever on the accelerating pump cover.**

Tighten the retaining screws.

SECONDARY FUEL BOWL AND METERING BODY OR METERING BLOCK

1. Assemble the secondary fuel bowl, perform a dry float adjustment, and assemble the metering block by following procedure steps 3, 5, 6, 7, 8, 10 and 12 under Primary Fuel Bowl and Metering Block.

PART 10-8— Air Cleaner

1 DESCRIPTION AND OPERATION

CONVENTIONAL AIR CLEANER

All engines except the standard 289 V-8 engines are equipped with a conventional dry-type air cleaner that has a replaceable filtering element. The air cleaner body is mounted on a sealing gasket, located on the carburetor air horn. The air cleaner assembly is retained on the engine by a stud on the carburetor body and a wing nut above the filter cover. The filter element has integral plastic gaskets, located on the top and bottom of the element. The gaskets prevent entry of dirt and unfiltered air into the engine.

The air from the engine compartment enters the air cleaner assembly through the opening (horn) on the side of the body, into a silencing chamber and passes through the filter element. Dust particles are trapped in the filter element as the air passes through it. After leaving the filter element, the air is deflected down into the carburetor.

HOT AND COLD AIR INTAKE AIR CLEANER

The standard 289 V-8 engines are equipped with a thermostatically controlled carburetor air inlet duct assembly.

The air cleaner body is mounted on a sealing gasket, located on the carburetor air horn. The air cleaner assembly is retained on the engine by a stud in the carburetor body and a wing nut above the filter cover. The replaceable filter element assembly has integral plastic gaskets located on the top and bottom of the element. The gaskets prevent entry of dirt and unfiltered air into the engine.

The thermostatically controlled air inlet duct and shroud assembly is attached to the air cleaner body with two wing screws. The shroud is positioned on the left exhaust manifold. The air inlet duct control mechanism consists of a valve plate, thermostat, adjustable thermostat rod, two springs and a retaining clip.

The air received from the air duct passes through a silencing chamber in the air cleaner body and then through the filter element. After leaving the filter element, the air is deflected down into the carburetor. Dust particles and other foreign materials are trapped in the filter element as the air rushes through it.

The temperature of the air entering the air cleaner is thermostatically controlled by the carburetor air duct assembly. Air from the engine compartment, or heated air from a shroud around the exhaust manifold, is available to the engine.

A thermostatic bulb in the air duct is exposed to the incoming air. A spring-loaded valve plate is connected to the thermostatic bulb through linkage. The valve plate spring holds the valve in the closed position (heat on) until the thermostatic bulb overcomes the valve tension.

During the engine warm-up period when the air temperature entering the air duct is less than 75 °F, the thermostat is in the retracted position and the valve plate is held in the up position (heat on) by the valve plate spring, thus shutting off the air from the engine compartment. All air is then drawn from the shroud around the exhaust manifold.

As the temperature of the air passing the thermostatic bulb approaches 85° F, the thermostat starts to expand, and pulls the valve plate down. This allows cooler air from the engine compartment to enter the air cleaner. When the temperature of the air reaches approximately 105° F, the valve plate will be in the down position (heat off) so that only engine compartment air is allowed to enter the air cleaner.

CLOSED CRANKCASE VENTILATION SYSTEM AIR CLEANERS

On the closed crankcase ventilation system engine models, air is drawn into the crankcase ventilation system at the integral air inlet tube, located on the air cleaner body, and passes through the connecting rubber hose into the crankcase ventilation system.

2 REMOVAL AND INSTALLATION

AIR CLEANER MAINTENANCE

Refer to Group 19 for the air cleaner assembly recommended maintenance mileage interval.

AIR CLEANERS AND FILTER ELEMENTS

REMOVAL

1. Disconnect the crankcase ventilation system hose, if so equipped, from the air cleaner body.
2. Remove the wing nut retaining the air cleaner assembly to the carburetor. On vehicles equipped with a hot and cold air intake duct, remove the two wing-type screws that secure the air duct and thermostat assembly to the air cleaner.
3. Remove the air cleaner assembly, then remove the cover and lift the filter element out of the air cleaner body.

CLEANING AND INSPECTION

Refer to Part 10-1, Section 3 for the carburetor air cleaner and filter element cleaning and inspection procedure.

INSTALLATION

1. Install a new air cleaner mounting gasket on the carburetor, if required.
2. Position the air cleaner body on the carburetor, and make certain the body is properly seated on the gasket.
3. Connect the air inlet duct and valve assembly, if so equipped, to the air cleaner with the wing-type retaining screws. Tighten the screws.
4. Place the filter element on the air cleaner body. Make sure the filter is properly seated. If the word TOP is indicated on the filter element, make sure the word TOP faces up. Install the cover and tighten the retaining wing nut.
5. Connect the crankcase vent hose, if so equipped, to the air cleaner and tighten the retaining clamp.

HOT AND COLD AIR INTAKE DUCT AND VALVE ASSEMBLY

The air intake duct thermostatic valve can be adjusted to change the air temperature at which the valve opens. Increasing the rod length will move the valve toward the heat-OFF position. Decreasing the rod length will move the valve toward the heat-ON position. Adjustments must be verified by removing the duct and valve assembly, and testing the opening temperature as detailed in Part 10-1, Section 1.

REMOVAL

1. Remove the air duct and shroud retaining nut and washer from the exhaust manifold.
2. Remove the two wing-type screws that secure the air duct and thermostat assembly to the air cleaner. Carefully lift the air duct, shroud and tube as an assembly from the engine.

DIAGNOSIS AND TESTING

Refer to Part 10-1, Section 1 for the air intake duct and valve testing procedures.

INSTALLATION

1. Install the air inlet duct and valve assembly and shroud on the exhaust manifold as a unit. Install the shroud retaining nut and washer. Tighten the nut.
2. Connect the air inlet duct and valve assembly to the air cleaner and tighten the wing-type retaining screws.

DISASSEMBLY

1. Loosen the retaining screw and separate the air inlet duct and valve assembly from the shroud and tube assembly.
2. If the duct and valve assembly was removed because of a suspected malfunction, check the operation of the thermostat and air duct assembly. Refer to the Air Intake Duct Test (Part 10-1, Section 1) for the proper procedure.
3. If inspection reveals that the valve plate is sticking or the thermostat is malfunctioning, remove the thermostat and valve plate as follows:

Detach the valve plate tension spring from the valve plate with the use of long-nose pliers. Loosen the thermostat lock nut and unscrew the thermostat from the mounting bracket. Remove the lock nut. Grasp the valve plate and withdraw it from the duct.

ASSEMBLY

1. If it was necessary to disassemble the thermostat and air duct and valve, assemble the unit as follows:

Install the valve plate. Install the lock nut on the thermostat, and screw the thermostat into the mounting bracket. Install the valve plate tension spring on the valve plate and duct.

Check the operation of the thermostat and air duct assembly. Refer to the Air Intake Duct Test (Part 10-1, Section 1) for the proper procedure. Adjust the thermostat, as required.

2. Connect the duct and valve assembly to the shroud and tube assembly. Tighten the retaining screw.

PART 10-9— *Fuel Pump and Fuel Filter*

1 DESCRIPTION AND OPERATION

A single action fuel pump is standard equipment for all vehicle models.

The fuel pump on the 6-cylinder engines is mounted on the lower, left-center of the engine cylinder block.

On all V-8 engines, the fuel pump is mounted on the left-side of the cylinder front cover.

A Carter permanently-sealed fuel pump is used on all engines (Figs. 1 and 2).

A separate in-line fuel filter (Fig. 3) is used on all engines. The filter is of one-piece construction and does not contain a cleanable filter element.

The fuel pumps are mechanically actuated by means of the fuel pump

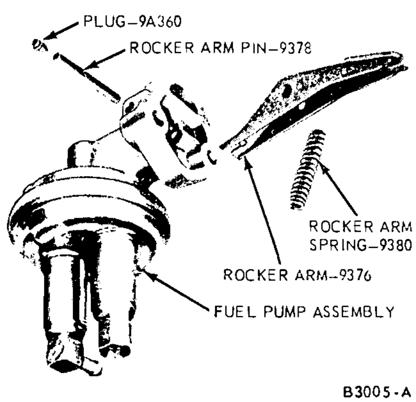


FIG. 1—Carter Fuel Pump for 6-Cyl Engines

rocker arm and an eccentric on the camshaft.

A flexible fuel pump diaphragm is operated by a combination of rocker arm action and calibrated spring tension.

On the fuel intake stroke, the camshaft eccentric causes the rocker arm to lift the fuel pump diaphragm against the diaphragm spring pres-

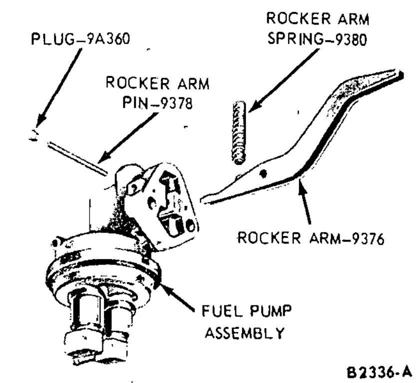


FIG. 2—Carter Fuel Pump for V-8 Engines

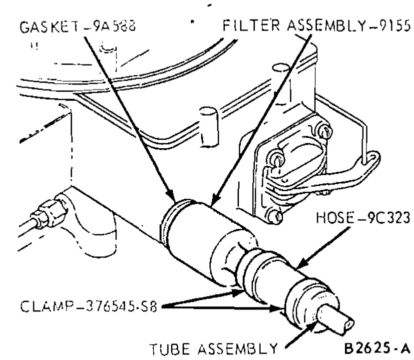


FIG. 3—Typical In-Line Fuel Filter Assembly

sure. This action draws fuel through the intake valve into the pump inlet chamber and closes the outlet valve. At the same time, fuel is drawn from the fuel tank through the fuel intake line to replace the fuel drawn into the chamber.

As the camshaft eccentric continues to rotate, the rocker arm relieves the pressure on the diaphragm spring and allows the spring to move the diaphragm toward the inlet and outlet valves, exerting pressure on the fuel inlet chamber. This pressure causes the pump inlet valve to close and the ensuing pressure build-up opens the outlet valve. The fuel is then forced through the pump outlet to the fuel filter where it is cleansed before entering the carburetor. **Fuel is delivered to the carburetor only when the fuel inlet valve in the carburetor is open. The carburetor inlet valve is closed by fuel pressure on the float when the specified fuel level in the carburetor float chamber is reached.**

When there is no demand for fuel from the carburetor, the diaphragm spring tension is not strong enough to force the diaphragm against the fuel pressure built up in the inlet chamber of the pump. Thus, the up and down rocker arm action continues, but the diaphragm remains stationary until pressure against the carburetor float is relieved by a demand for fuel at the carburetor.

The Carter permanently-sealed pumps contain pressure relief orifices in the inlet valve cage to prevent pressure build-up in the pump during hot soak periods.

An air vent is located in the fuel pump bodies to relieve air pressure build-up on the spring side of the diaphragm.

The fuel pumps contain a diaphragm rod seal to prevent the entrance of engine oil into the fuel pump.

2 REMOVAL AND INSTALLATION

FUEL FILTER REPLACEMENT

The in-line fuel filter used on all engines (Fig. 3) is of one-piece construction and cannot be cleaned. Replace the filter if it becomes clogged or restricted.

1. Remove the air cleaner (Part 10-8, Section 2).
2. Loosen the retaining clamp securing the fuel inlet hose to the fuel filter (Fig. 3).
3. Unscrew the fuel filter from

the carburetor and discard the gasket. Disconnect the fuel filter from the hose and discard the retaining clamp.

4. Install a new clamp on the inlet hose and connect the hose to the filter. Place a new gasket on the new fuel filter and screw the filter into the carburetor inlet port. Tighten the filter.

5. Position the fuel line hose clamp and crimp the clamp securely.

6. Start the engine and check for fuel leaks.

7. Install the air cleaner (Part 10-8, Section 2).

FUEL PUMP REMOVAL

1. Disconnect the inlet line and the outlet line at the fuel pump.

2. Remove the fuel pump retaining screws and remove the pump and the gasket. Discard the gasket.

FUEL PUMP INSTALLATION

1. Remove all the gasket material from the mounting pad and pump. Apply oil-resistant sealer to both sides of a new gasket. Position the new gasket on the pump flange and hold the pump in position against the mounting pad. Make sure the rocker arm is riding on the camshaft eccentric.

2. Press the pump tight against the pad, install the retaining screws, and alternately torque them to specifications.

3. Connect the fuel inlet hose (use a new clamp on the hose) and the outlet line. Crimp the retaining clamp securely.

4. Operate the engine and check for fuel leaks.

3 MAJOR REPAIR OPERATIONS

DISASSEMBLY

The fuel pump assembly is shown in Figs. 1 and 2.

1. Scrape away the staking mark and remove the rocker arm pin seal plug as shown in Fig. 4.

2. Release the tension on the rocker arm spring pressure and allow the rocker arm pin to fall out. If the pin does not come out freely, tap the fuel pump assembly lightly on the bench until the pin sticks out of the bore; then, remove the pin with pliers. Remove the rocker arm and spring(s).

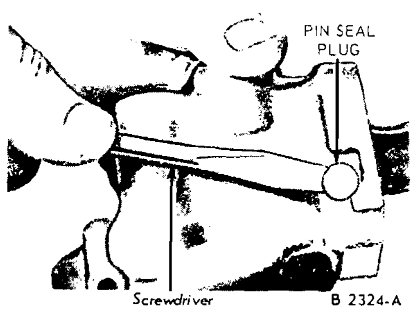


FIG. 4—Rocker Arm Pin Seal Plug Removal

CLEANING AND INSPECTION

Clean and inspect the fuel pump. Refer to Cleaning and Inspection (Part 10-1, Section 3) for the proper procedure.

ASSEMBLY

The fuel pump assembly is shown in Figs 1 and 2.

1. Insert the rocker arm spring into the spring guide bore in the dome of the fuel pump rocker arm cavity.

2. Insert the rocker arm into the cavity and hook it onto the diaphragm rod, directly below the rod flange. Position the rocker arm spring(s) over the spring locater(s) on the rocker arm. Align the rocker arm pin holes and install the rocker arm pin. Make certain the rocker arm spring(s) is properly positioned on the spring locater on the rocker arm.

3. Install a new rocker arm pin plug. Stake the plug into position.

PART 10-10—*Fuel Tank and Lines*

1 DESCRIPTION AND OPERATION

The fuel systems are shown in Figs. 1-4.

The fuel tank used on the Mercury Intermediate (except station wagon models), Falcon (except station wagon models), Fairlane (except station wagon and Ranchero models), Mustang and Cougar is located in the center of the luggage compartment floor and is retained to the floor by screws. The fuel tank used on the Falcon station wagon and Fairlane Ranchero models is basically the same but is inverted and retained by two steel support straps. The fuel tank used on the Mercury Intermediate station wagon models and the Fairlane station wagon models is located behind the wheel opening in the left rear quarter panel and is held in position by one steel support strap.

The fuel tank sender unit is located on the front side of the tank and is accessible from underneath the vehicle. On Mercury Intermediate station wagon models and Fairlane station wagon models, a fuel tank guard in the wheel well must be removed to gain access to the fuel sender unit.

The fuel outlet line is fastened to a connecting hose that is attached to a line which enters the fuel tank through the sender unit assembly. A filter is located in the tank on the fuel line pick-up tube. **This filter does not require servicing.**

The Fairlane (except station wagon models and Ranchero) fuel tank filler pipe is located behind the rear license plate. The Mustang and Cougar fuel tank filler pipe is located in the center of the lower back panel. On all other models, the fuel tank filler pipe is located in the left rear quarter panel.

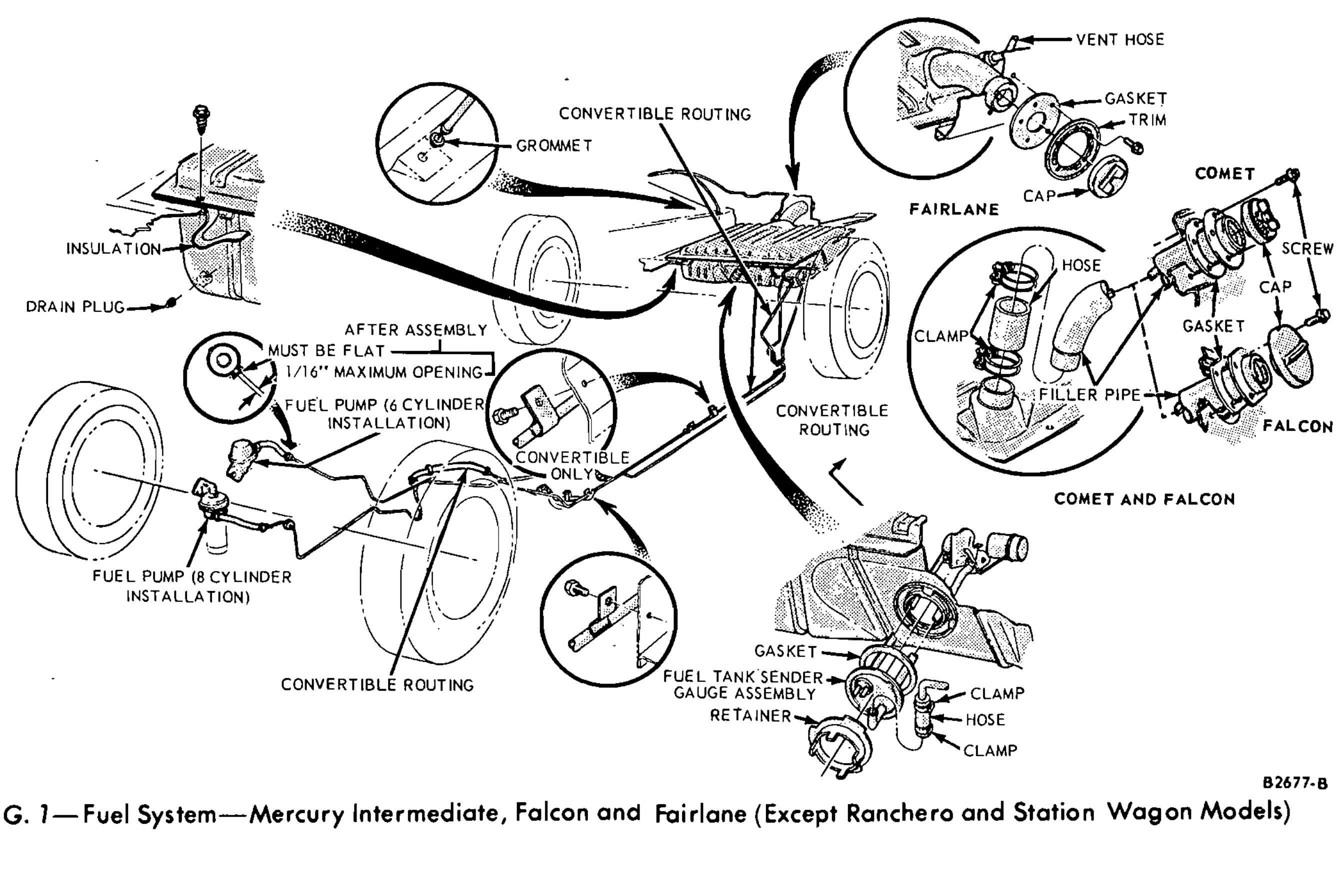


FIG. 1—Fuel System—Mercury Intermediate, Falcon and Fairlane (Except Ranchero and Station Wagon Models)

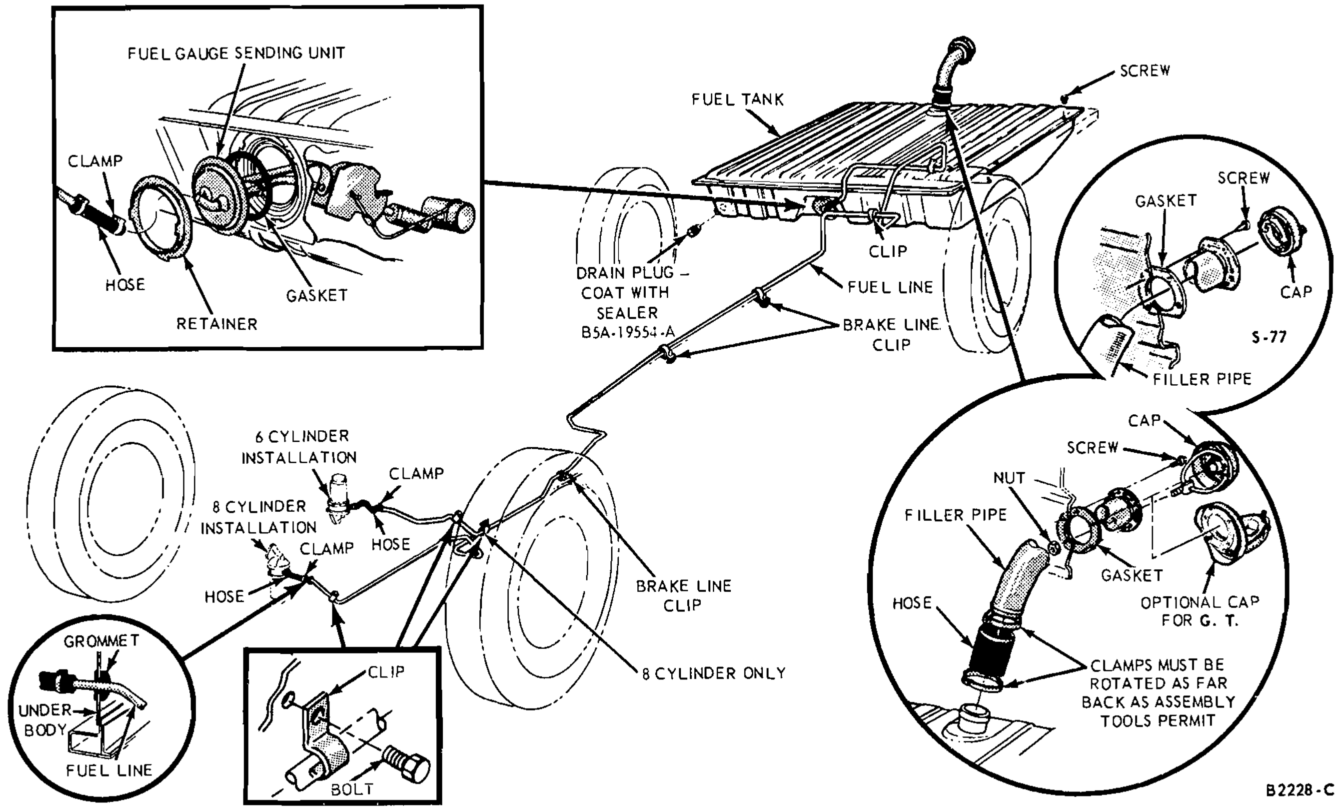


FIG. 2—Fuel System—Mustang

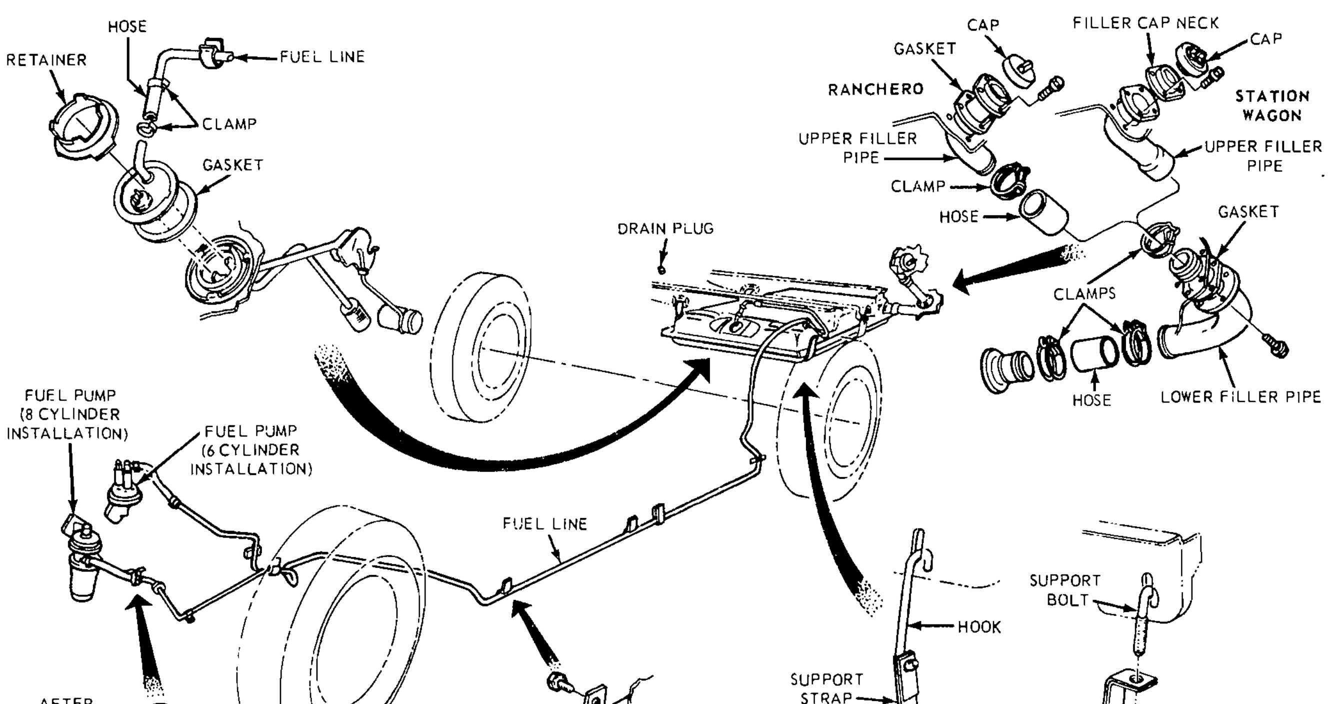


FIG. 3—Fuel System—Fairlane Ranchero and Falcon Station Wagon Models

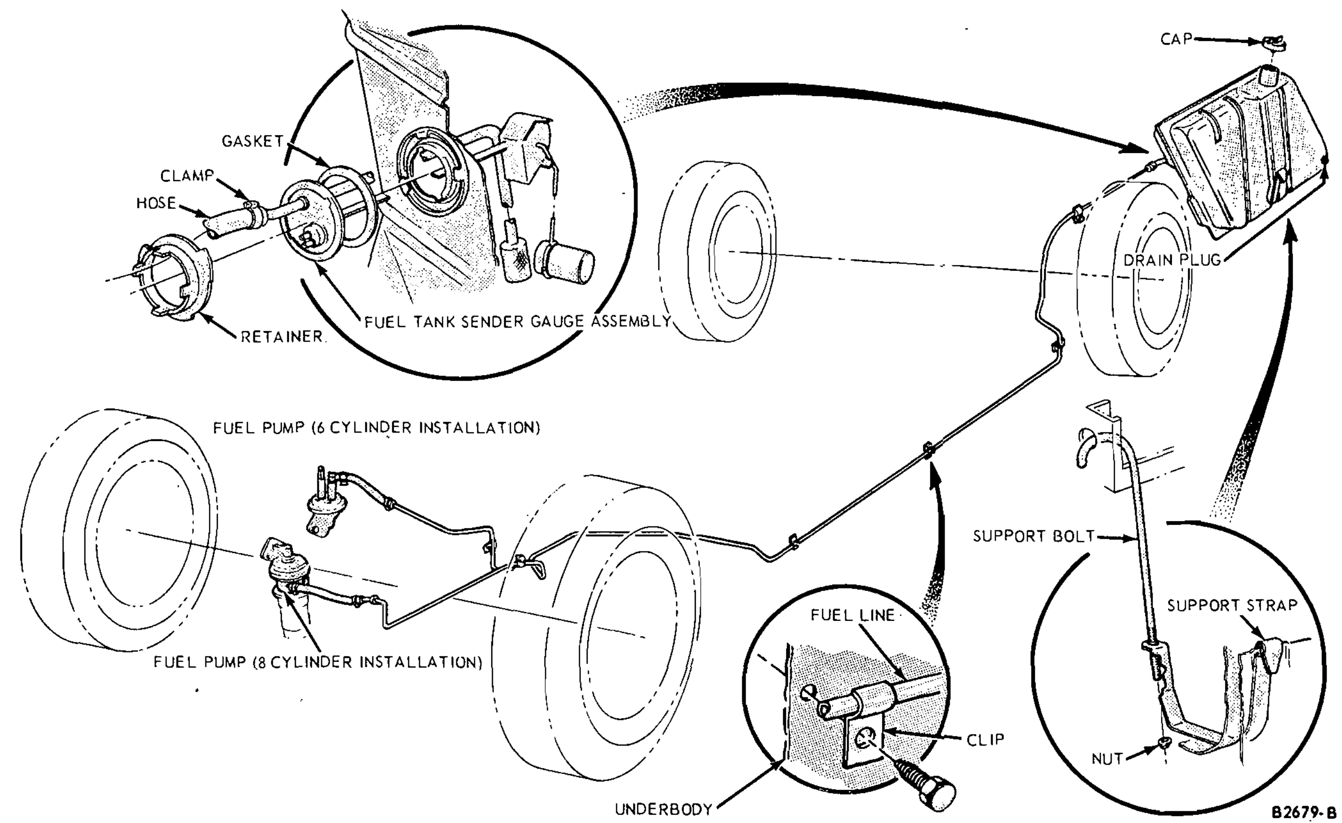


FIG. 4—Fuel System—Mercury Intermediate and Fairlane Station Wagon Models

On Fairlanes (except station wagon models), the fuel tank is vented by a vent tube. On all other models, the fuel tank is vented through the fuel filler cap.

The fuel line is routed from the fuel tank, passing beneath the left side of the underbody; then, under the left fender and through the forward part of the fender apron. The complete fuel line is not normally replaced as a unit, only the damaged segments are usually replaced.

2 REMOVAL AND INSTALLATION

FILLER PIPE

FAIRLANE (ALL MODELS) AND MERCURY INTERMEDIATE (STATION WAGON MODELS ONLY)

The fuel tank filler pipe is a part of the fuel tank on these models and cannot be replaced separately.

FALCON (EXCEPT STATION WAGON MODELS), MERCURY INTERMEDIATE (EXCEPT STATION WAGON) MUSTANG AND COUGAR

Removal

1. Drain the fuel tank with a siphon to a level below the filler pipe opening in the tank. The gas should be drained into a suitable clean container.
2. Remove the retaining screws securing the filler pipe to the body panel.
3. Loosen the hose clamp and loosen the hose from the filler pipe.
4. Rotate the filler pipe and pull it outward to remove it from the fuel tank.

Installation

1. If necessary install new hose clamps on the filler pipe hose.
2. Place the gasket on the filler pipe.
3. Position the filler pipe in the body panel and slide the hose onto the filler pipe.
4. Install and tighten the filler pipe retaining screws.
5. Tighten the hose clamp and install the siphoned gas back in the fuel tank.

FAIRLANE RANCHERO AND STATION WAGON MODELS

Removal

1. Drain the fuel tank with a siphon to a level below the filler pipe opening in the fuel tank. The gas should be drained into a suitable clean container.
2. Working from inside the rear quarter panel, loosen the hose clamp(s).
3. Working from underneath the vehicle, loosen the hose clamps and remove the retaining screws securing the lower filler pipe to the body.
4. Remove the retaining screws securing the upper filler pipe to the body panel.
5. Pull the lower filler pipe down and remove it from the vehicle.
6. Pull the upper filler pipe out

through the body panel. The end of the upper filler pipe will have to be folded over for removal through the body panel.

Installation

1. If necessary, install new hose clamps on the filler pipe hose(s).
2. Place the gasket on the lower filler pipe and slide it into the body panel and hose from the fuel tank. Install the retaining screws and tighten the hose clamps.
3. On ranchero models, slide the hose onto the lower filler pipe. Place the gasket on the upper filler pipe and slide the upper filler pipe through the opening in the body side panel and into the hose. Install the upper filler pipe retaining screws and tighten the hose clamps.
4. On station wagon models, fold over the end of the upper filler pipe and slide it through the body side panel and over the lower filler pipe. Install the filler pipe neck retaining screws and tighten the hose clamp.
5. Place the siphoned fuel back in the fuel tank.

FUEL TANK

The fuel tank installations are shown in Figs. 1 thru 4.

ALL EXCEPT STATION WAGON AND FAIRLANE RANCHERO MODELS

Removal

1. Raise the rear of the vehicle and position safety stands.
2. Remove the fuel tank drain plug and drain the fuel into a suitable container.
3. Disconnect the fuel gauge sending unit wire at the sending unit.
4. Loosen the hose clamp, slide the clamp forward and disconnect the fuel line at the fuel gauge sending unit.
5. Disconnect the fuel tank vent hose at the tank, if so equipped.

If the fuel gauge sending unit is to be removed, turn the unit retaining ring counterclockwise and remove the sending unit retaining ring and gasket.

6. Remove the spare tire from the luggage compartment. Pull the compartment floor mat out of the way for access to the fuel tank.
7. Remove the fuel tank filler neck retaining screws.
8. Loosen the filler neck to tank hose clamps. Remove the filler neck, mounting gasket, and filler neck to tank hose.
9. Remove the fuel tank to luggage compartment floor pan retaining screws and remove the fuel tank.

Installation

1. Make sure all the old sealer has been removed from the fuel tank mounting flange and mounting surface at the luggage compartment floor pan. Apply caulking cord to the fuel tank mounting surface at the luggage compartment floor pan.
2. Position the fuel tank to the luggage compartment floor pan and install the retaining screws.
3. Position the hose and filler neck assembly and gasket to the body back panel. Position the hose to the fuel tank neck.
4. Install the filler neck to body back panel retaining screws and tighten the hose clamps.
5. If the fuel gauge sending unit was removed, make sure all the old gasket material has been removed from the unit mounting surface on the fuel tank. Using a new gasket, position the fuel gauge to the fuel tank and secure with the retaining ring.
6. Position the luggage compartment floor mat and install the spare tire.
7. Connect the fuel gauge sending unit wire to the sending unit.
8. Connect the fuel line at the fuel gauge sending unit and tighten the hose clamps securely. Install the drain plug.
9. Connect the fuel tank vent hose, if so equipped.
10. Remove the safety stands and lower the vehicle.
11. Fill the tank and check all connections for leaks.

FALCON STATION WAGON AND FAIRLANE RANCHERO MODELS

Removal

1. Siphon the fuel from the fuel tank into a suitable container.
2. Loosen the filler hose clamp at the tank and disconnect the hose.
3. Disconnect the fuel gauge sending unit wire at the sending unit.
4. Loosen the clamps and disconnect the flexible fuel line at the sending unit.
5. Remove the two nuts retaining the fuel tank support straps to the underbody. Remove the straps and lower the tank.
6. Remove the fuel gauge sending unit.

Installation

1. Using a new gasket, install the fuel gauge sending unit.
2. Hold the tank in position against the underbody. Hook the support straps to the retainers in the underbody. Position the straps over the studs, then install the nuts retaining the straps to the underbody.
3. Connect the fuel line and filler hose.
4. Connect the fuel gauge sending unit wire.
5. Fill the tank and check all connections for leaks.

FAIRLANE AND MERCURY INTERMEDIATE STATION WAGONS

Removal

1. Remove the filler cap. Using necessary precautions, siphon the fuel into a suitable clean container.
2. Raise the vehicle on a hoist.
3. Remove the left rear wheel assembly.
4. Remove the wheel well splash shield.
5. Disconnect the fuel gauge sending unit wire and fuel line at the sending unit.
6. Remove the nut retaining the tank support strap to the body. Remove the strap and remove the tank.
7. Remove the sending unit from the old tank if a new tank is to be installed.

Installation

1. If a new tank is to be installed, install the fuel gauge sending unit and a new mounting gasket in the fuel tank.
2. Hold the tank in position and install the retaining strap.
3. Connect the fuel line and sending unit wire to the sending unit.
4. Install the wheel well splash shield.
5. Install the left rear wheel and lower the vehicle.

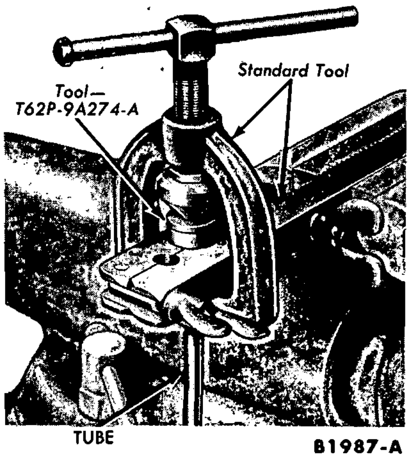


FIG. 5—Fuel Line Tube Die

6. Fill the fuel tank and install the filler cap.

7. Check all connections for leaks.

FUEL LINES

The various fuel lines (Figs. 1 thru 4) are not serviced as assemblies. They must be cut, squared and formed out of rolls of fuel system service tubing and hose material available at dealerships.

A damaged section of **tubing** longer than 12 inches can be cut out of the existing line and replaced by a comparable service **tubing section**, spliced into the line by means of connecting hoses and retaining clamps.

A damaged section of tubing shorter than 12 inches can be cut out of the line and replaced by a length of service hose and two retaining clamps. **All replacement hoses must be cut to a length that will insure proper clamp retention beyond the flared ends of the connecting tubing.**

REMOVAL

1. Drain the fuel from the tank.

2. Disconnect the line at the fuel gauge sender unit and the fuel pump. Remove the lines from the holding clips along the underbody. Remove all damaged hose sections and tube sections.

INSTALLATION

1. Cut a new section of tubing to approximately the same length as the section to be replaced. **Allow extra length for flaring the ends of the tubing.** Square the ends of the cut tubing with a file.

2. Ream the inside edges of the cut tubing with the reamer blade on the tube cutter. **Be sure metal chips are removed from inside the tube(s).** Flare the ends of the cut tubing, as required, with a standard tube flaring kit and tool (Fig. 5).

3. Bend the tube section to conform to the contour of the original tube. Cut an ample length of hose to form a coupling between the flared ends of the fuel lines. Connect the hose couplings to the tubing and install the retaining clamps.

4. Position the lines in the underbody clips and tighten the clips. Connect the line to the fuel gauge sender unit and the fuel pump. Fill the tank and check for leaks.

PART 10-11—Specifications

CARBURETORS

NOTE: All specifications are given in inches unless otherwise noted.

The basic part number of all the carburetors is 9510.

The part number prefix and suffix appears on the identification tag mounted on the carburetor.

Always refer to the Master Parts Catalog for parts usage and interchangeability before replacing a carburetor, or a component part for a carburetor.

CARBURETOR APPLICATION ①

Engine	Vehicle Application	Carburetor	Carburetor Part Number (9510) — Without Exhaust Emission: Standard Transmission	Without Exhaust Emission: Automatic Transmission	With Exhaust Emission: Standard Transmission ②	With Exhaust Emission: Automatic Transmission
170	Falcon	Autolite 1100 1-V	C6DF-S	C6DF-R	C7DF-J	C7DF-K
170	Falcon	Carter YF 1-V	–	–	–	C7DF-T ③
200	Mercury Intermediate Cougar, Fairlane, Falcon, Mustang	Carter YF 1-V	–	–	–	C7ZF-A ③
200	Mercury Intermediate Cougar, Fairlane, Falcon, Mustang	Autolite 1100 1-V	C6OF-AD	C6OF-AC	C7OF-N	C7OF-R
200	Fairlane Taxi	Autolite 1100 1-V	C6OF-AB			
289 2-V	Mercury Intermediate Cougar, Fairlane, Falcon, Mustang	Autolite 2100 2-V	C7DF-E	C7DF-F	C7DF-G	C7DF-H or C7DF-N ② ④
						C7DF-V ② ⑤
289 4-V	Mustang HP	Autolite 4100 4-V	C6ZF-C			
289 4-V	Cougar, Fairlane, Mustang	Autolite 4300 4-V	C7DF-L	C7DF-M	C7DF-C	C7DF-D
390 2-V	Mercury Intermediate Fairlane	Autolite 2100 2-V	C7OF-U, C7OF-AE or C7OF-J	C7OF-U, C7OF-AK or C7OF-K	C7OF-AD or C7OF-L	C7OF-AF, C7OF-AL or C7OF-M ②
390 4-V	Mercury Intermediate Fairlane Except GT	Autolite 4300 4-V	C7AF-AC	C7OF-AJ or C7OF-S	C7AF-AG	C7OF-AH or C7OF-H ②
390 GT	Mercury Intermediate Cougar, Fairlane, Mustang	Holley 4150-C 4-V	C7OF-A	C7OF-B	C7OF-C or C7OF-A	C7OF-D or C7OF-B

① The basic part number of all the carburetors is 9510. The part number prefix and suffix appears on the identification tag mounted on the carburetor. Always refer to the Master Parts Catalog for parts usage and interchangeability before replacing a carburetor, or a component part for a carburetor.

② Thermactor Exhaust Emission
③ Imco Exhaust Emission
④ Early Production
⑤ Late Production

CARBURETOR GENERAL INFORMATION

Carb Part Number	Throttle Bore Dia Pri	Throttle Bore Dia Sec	Venturi Diameter Pri	Venturi Diameter Sec	Main Metering Jet Normal Pri	Main Metering Jet Normal Sec	Main Metering Jet Altitude Pri	Main Metering Jet Altitude Sec	Booster Venturi Pri	Booster Venturi Sec	Power Valve Color Normal	Power Valve Color Altitude	Spark Valve Color	Choke Spring Ident.
Autolite Model 1100 Carburetor														
C6DF-R	1.437	–	1.100	–	63F	–	61F	–	–	–	–	–	Plain	TP
C6DF-S	1.437	–	1.100	–	64F	–	62F	–	–	–	–	–	Plain	TS
C6OF-AB	1.437	–	1.100	–	62F	–	60F	–	–	–	–	–	Plain	TS
C6OF-AC	1.437	–	1.200	–	68F	–	66F	–	–	–	–	–	Plain	TP
C6OF-AD	1.437	–	1.200	–	69F	–	67F	–	–	–	–	–	Plain	TS
C7DF-J	1.437	–	1.100	–	63F	–	61F	–	–	–	–	–	–	TS
C7DF-K	1.437	–	1.100	–	62F	–	60F	–	–	–	–	–	–	TP
C7OF-N	1.437	–	1.100	–	62F	–	60F	–	–	–	–	–	–	TS
C7OF-R	1.437	–	1.100	–	60F	–	58F	–	–	–	–	–	–	TP
Carter Model YF Carburetor														
C7DF-T	1.437	–	1.250	–	0.098	–		–	–	–	–	–	–	T

CARBURETOR GENERAL INFORMATION (CONTINUED)

Part Number	Throttle Bore Dia		Venturi Diameter		Main Metering Jet Normal		Main Metering Jet Altitude		Booster Venturi		Power Valve Color		Spark Valve Color	Choke Spring Ident.
	Pri	Sec	Pri	Sec	Pri	Sec	Pri	Sec	Pri	Sec	Normal	Altitude		
Autolite Model 2100 Carburetor														
C7DF-E •	1.437	–	1.028	–	44F	–	42F	–	DC	–	Red	Plain	–	TO
C7DF-F	1.437	–	1.028	–	42F	–	40F	–	DA	–	Red	Plain	–	TO
C7DF-G	1.437	–	1.028	–	45F	–	43F	–		–	Plain	Green	–	TO
C7DF-H	1.437	–	1.028	–	45F	–	43F	–		–	Yellow	Black	–	TO
C7DF-N	1.437	–	1.028	–	53F	–	51F	–	G	–	Plain	Green	–	TO
C7DF-V	1.437	–	1.145	–	50F	–	48F	–	K	–	Black		–	TO
C7OF-J	1.564	–	1.231	–	56F	–	54F	–	L	–	Plain	Green	–	TN
C7OF-K	1.687	–	1.231	–	56F	–	54F	–	G	–	Brown	Orange	–	TO
C7OF-L	1.564	–	1.231	–	57F	–	55F	–		–	Red	Plain	–	TW
C7OF-M	1.564	–	1.231	–	57F	–	55F	–		–	Plain	Green	–	TW
C7OF-U	1.687	–	1.233	–	56F	–	54F	–	L	–	Plain	Green	–	TN
C7OF-AD	1.687	–	1.233	–	54F	–	52F	–	Y	–	Plain	Green	–	TW
C7OF-AE	1.687	–	1.233	–	54F	–	52F	–	Y	–	Plain	Green	–	TN
C7OF-AF	1.687	–	1.233	–	53F	–	51F	–	G	–	Plain	Green	–	TO
C7OF-AK	1.687	–	1.233	–	54F	–	52F	–	G	–	Plain	Green	–	TC
C7OF-AL	1.687	–	1.233	–	54F	–	52F	–	G	–	Plain	Green	–	TO
Autolite Model 4100 Carburetor														
C6ZF-C	1.562	1.562	1.125	1.189	52F	68F	50F	55F	M	BA	Plain	Green		
Autolite Model 4300 Carburetor														
C7DF-C	1.437	1.562	1.000	–	52F	–	50F	–	–	–	–	–	–	BY
C7DF-D	1.437	1.562	1.000	–	51F	–	49F	–	–	–	–	–	–	BX
C7DF-L	1.437	1.562	1.000	–	52F	–	50F	–	–	–	–	–	–	BY
C7DF-M	1.437	1.562	1.000	–	51F	–	49F	–	–	–	–	–	–	BX
C7OF-H	1.437	1.562	1.000	–	51F	–	49F	–	–	–	–	–	–	BW
C7OF-S	1.437	1.562	1.000	–	51F	–	49F	–	–	–	–	–	–	BW
C7OF-AH	1.437	1.562	1.000	–	48F	–	46F	–	–	–	–	–	–	BO
C7OF-AJ	1.437	1.562	1.000	–	48F	–	46F	–	–	–	–	–	–	BO
Holley Model 4150-C Carburetor														
C7OF-A	1.560	1.560	1.250	1.312	68	71	66	69	–	–	65	–	–	57MI
C7OF-B	1.560	1.560	1.250	1.312	68	71	66	69	–	–	65	–	–	57MI
C7OF-C	1.560	1.560	1.250	1.310	65	71	63	69	–	–	65	–	–	GT
C7OF-D	1.560	1.560	1.250	1.310	65	71	63	69	–	–	65	–	–	57MI

CARBURETOR SETTINGS AND ADJUSTMENTS

Carb Part No. (9510)	Choke Spring Housing Setting	Choke Plate Clearance (Pull-Down) 0.036 Inch Gauge ①	Accelerator Pump Setting		Dry Float Setting		Fuel Level (Wet)		Fast Idle RPM	Curb Idle RPM ③ ④	Anti-Stall Dashpot (If So Equipped) Clearance At Curb Idle	Secondary Throttle Plate Setting	Fast Idle Cam Setting
			Pump Lever	Throttle Lever	Pri	Sec	Pri	Sec					
Autolite Model 1100 Carburetor													
C6DF-R	Index	0.140–0.160	0.190 ②	②	1 3/32	–	–	–	1500	500	3 1/2 Turns	–	–
C6DF-S	2 Lean	0.100–0.120	0.190 ②	②	1 3/32	–	–	–	1300	575	–	–	–
C6OF-AB	1 Lean	0.130–0.150	0.190 ②	②	1 3/32	–	–	–	1300	575	–	–	–
C6OF-AC	Index	0.140–0.160	0.190 ②	②	1 3/32	–	–	–	1500	500	3 1/2 Turns	–	–
C6OF-AD	1 Lean	0.130–0.150	0.190 ②	②	1 3/32	–	–	–	1300	575	–	–	–
C7DF-J	2 Lean	0.100–0.120	0.190 ②	②	1 3/32	–	–	–	1400	700	2 Turns	–	–
C7DF-K	Index	0.140–0.160	0.190 ②	②	1 3/32	–	–	–	1500	550	2 Turns	–	–
C7OF-N	2 Lean	0.100–0.120	0.190 ②	②	1 3/32	–	–	–	1400	700	2 Turns	–	–
C7OF-R	Index	0.140–0.160	0.190 ②	②	1 3/32	–	–	–	1500	500	2 Turns	–	–

CARBURETOR SETTINGS AND ADJUSTMENTS (CONTINUED)

Carb Part No. (9510)	Choke Spring Housing Setting	Choke Plate Clearance (Pull-Down) 0.036 Inch Gauge ①	Accelerator Pump Setting		Dry Float Setting		Fuel Level (Wet)		Fast Idle RPM	Curb Idle RPM ③ ④	Anti-Stall Dashpot (If So Equipped) Clearance At Curb Idle	Secondary Throttle Plate Setting	Fast Idle Cam Setting
			Pump Lever	Throttle Lever	Pri	Sec	Pri	Sec					
Carter Model YF Carburetor													
C7DF-T	1 Rich	0.250 ①	No Adj.	–	0.218	–	–	–	–	550	1/8	–	0.063
Autolite Model 2100 Carburetor													
C7DF-E	Index	0.110–0.130	Inboard	③	0.375	–	0.750	–	1400	575	–	–	0.100–0.120
C7DF-F	2 Rich	0.110–0.130	Inboard	③	0.531	–	0.905	–	1600	475	0.060–0.090	–	0.100–0.120
C7DF-G	Index	0.110–0.130	Outboard	③	0.531	–	0.905	–	1400	625	0.110–0.140	–	0.100–0.120
C7DF-H	2 Rich	0.110–0.130	Outboard	③	0.531	–	0.905	–	1600	550	0.110–0.140	–	0.100–0.120
C7OF-J	Index	0.190–0.210	Inboard	③	0.484	–	0.875	–	1300	575	–	–	0.150–0.170
C7OF-K	2 Rich	0.170–0.190	Inboard	③	0.375	–	0.750	–	1400	475	–	–	0.140–0.160
C7OF-L	Index	0.190–0.210	Outboard	④	0.531	–	0.905	–	1300	625	0.080–0.110	–	0.160–0.180
C7OF-M	Index	0.170–0.190	Outboard	④	0.531	–	0.905	–	1500	550	0.080–0.110	–	0.140–0.160
C7DF-N	2 Rich	0.120	Inboard	③	0.406	–	0.781	–	1600	550	1/8	–	0.100
C7DF-V	2 Rich	0.120	Inboard	③	0.375	–	0.750	–	1600	550	1/8	–	0.110
C7OF-U	Index	0.200	Inboard	③	0.484	–	0.875	–	1400	575	1/8	–	0.160
C7OF-AD	Index	0.180	Inboard	③	0.406	–	0.781	–	1300	625	–	–	0.160
C7OF-AE	Index	0.200	Inboard	③	0.406	–	0.781	–	1300	575	1/8	–	0.160
C7OF-AF	Index	0.120	Inboard	③	0.406	–	0.781	–	1500	625	–	–	0.100
C7OF-AK	Index	0.200	Inboard	③	0.406	–	0.781	–	1400	475	1/8	–	0.100
C7OF-AL	Index	0.120	Inboard	③	0.406	–	0.781	–	1500	625	–	–	0.100
Autolite Model 4100 Carburetor													
C6ZF-C		0.210–0.250	Inboard	③	0.491	0.621	0.875	1.000	–	750	–	1 Turn ⑨	–
Autolite Model 4300 Carburetor													
C7DF-C	Index	0.140–0.160	①	–	25/32	–	–	–	1400	625	1/8	–	0.090–0.110
C7DF-D	Index	0.090–0.110	①	–	25/32	–	–	–	1600	550	1/8	–	0.090–0.110
C7DF-L	Index	0.140–0.160	①	–	25/32	–	–	–	1400	600	–	–	0.090–0.110
C7DF-M	Index	0.090–0.110	①	–	25/32	–	–	–	1600	525	–	–	0.090–0.110
C7OF-H	Index	0.190–0.210	①	–	25/32	–	–	–	1500	550	1/8	–	0.090–0.110
C7OF-S	Index	0.190–0.210	①	–	25/32	–	–	–	1400	475	–	–	0.090–0.110
C7OF-AH	Index	0.100	③	–	25/32	–	–	–	1200	550	1/8	7/16 ⑤	0.080
C7OF-AJ	Index	0.100	③	–	–	–	–	–	1200	475	1/8	7/16 ⑤	0.080
Holley Model 4150-C Carburetor													
C7OF-A	2 Rich	–	No. 1	–	⑦	⑦	⑧	⑧	1850	575	–	–	–
C7OF-B	2 Rich	–	No. 1	–	⑦	⑦	⑧	⑧	1900	475			
C7OF-C	2 Rich	–	No. 1	–	⑦	⑦	⑧	⑧	1850	625	–	1/2 Turn	–
C7OF-D	2 Rich	–	No. 1	–	⑦	⑦	⑧	⑧	1900	550	–	1/2 Turn	–

① Dechoke Clearance–Choke plate to air horn Autolite 1-V, 2-V and 4-V....................1/16
② Accelerator Pump adjustments–Autolite 1-V Accelerator Pump Lever Clearance–Given in inches with pin in HI position and Throttle Plate Seated.
Accelerator pump lever adjustment–pin placement 50° F or below....................HI
Above 50° F and/or above 5,000 Ft....................LO
③ Idle fuel mixture adjustment–initial setting – All Carburetors....................1 to 1 1/2 turns open
④ Idle Speed adjustment–initial setting – All Carburetors....................1 1/2 turns open
⑤ Primary travel–at specified setting between primary throttle plate and bore (downstream side), pawl on throttle lever should just contact tang on secondary throttle over-travel spring.
⑥ Parallel with Float Bowl when Bowl is inverted
⑦ At lower edge of sight plug.
⑧ Turns after screw contacts lever.
⑨ Clearance between throttle plate and bore with choke plate closed and throttle plate held open by fast idle cam.

AIR CLEANER APPLICATION

Car Model	Engine Application	Color	Type	Car Model	Engine Application	Color	Type
Mercury Intermediate	All Except 390 4-V, V-8	Blue	Dry	Fairlane	All Except GT and GTA 390 4-V, V-8	Blue	Dry
Mercury Intermediate	390 4-V, V-8 and GT and GTA 390 4-V, V-8	Chrome and Blue	Dry	Fairlane	GT and GTA 390 4-V, V-8	Blue and Chrome	Dry
Falcon	All Engines	Blue	Dry	Mustang	All	Blue	Dry
Cougar	289 V-8	Blue	Dry	Cougar	390 V-8	Chrome and Blue	Dry

FUEL PUMP

Engine Application	Min. Volume—Flow @ 500 Eng. RPM	Static Pressure—PSI @ 500 Eng. RPM	Intake Static Vacuum (Min.)—In. HG @ 500 Eng. RPM	Eccentric Total Lift—Inches	Booster Pump Static Vacuum (Min.)—In. HG @ 500 Eng. RPM
170 Six	1 pint/30 seconds	4.0–6.0	6.0	0.290–0.310	11.00
200	1 pint/30 seconds	4.0–6.0	6.0	0.290–0.310	Not Applicable
289 V-8	1 ping/20 seconds	4.5–6.5	6.0	0.690–0.710	10.00
390, 427 V-8	1 ping/20 seconds	4.5–6.5	6.0	0.690–0.710	Not Applicable

FUEL TANK CAPACITIES

Car Model	Gallons		Car Model	Gallons	
	U.S. Measure	Imperial Measure		U.S. Measure	Imperial Measure
Mercury Intermediate	20	16 3/4	Cougar	16	13 1/4
Falcon—except Sedan Delivery and Station Wagon	16	13 1/4	Mustang	16	13 1/4
Falcon Sedan Delivery and Station Wagon	20	16 3/4	Fairlane	20	16 3/4

SPECIAL TOOLS

Tool	Number	Tool	Number
Choke Plate Staking Pliers	9586	Fuel Pump Overhaul Tools	T56L-9350-A
Fuel Level Gauge	T52L-9550-AGE	Float Bending Tool	9564-A
Fuel Pump Valve Installing Tool	T56L-9350-A or 9350-D	Fuel Line Tube Die	T62P-9A274-A
Fuel Pump Rocker Arm Pin Removing Tool	T56L-9350-A	Throttle Connecting Link Bending Tool	99798
Holley Float Setting Tool	9950-M	Throttle Shaft Bending Tool	9581
Power Valve Test Fixture	T57L-9904-A		
Wire Gauges — Specified Clearance Sizes As Required			

Cooling System

GROUP
11

PART 11-1— *General Cooling System Service*

This part covers general cooling system service. For cooling system component removal, disassembly, assembly, installation, major repair procedures and specifications, refer to the pertinent part of this group.

Radiator identification on the downflow units can be found on the left hand side bracket, as viewed from the drivers seat. On the crossflow type the identification is marked on the top bracket. The radiator chart can be found in the specification section (Part 11-4). Use the service part number to order a new part. As a double check, the number of fins per inch should be checked. However, for accuracy the total fins over at least four inches should be counted; then divided by the number of inches.

1 DIAGNOSIS AND TESTING

DIAGNOSIS

Engine overheating and slow engine warm-up are the two engine troubles most commonly attributed to the cooling system.

Loss of coolant, thermostat stuck in the closed position, restricted air flow through the radiator, or accumulation of rust and scale in the system are the main causes of overheating. Coolant loss may be due to external leakage at the radiator, radiator pressure cap, water pump, hose connections, heater, or core plugs. Coolant loss may also be caused by internal leakage due to a defective cylinder head gasket, improper tightening of the cylinder head bolts, or warped cylinder head or block gasket surfaces.

Serious internal leakage can be detected by operating the engine at fast idle and looking for the formation of bubbles in the radiator. Oil in the radiator may indicate leakage in the engine block or a leak in the automatic transmission oil cooler. Water formation on the oil level dipstick could also be an indication of internal leakage.

Rust and scale that form in the engine water passages are carried into the radiator passages by the circulation of the coolant. This clogs the radiator passages and causes overheating, Rust can be detected by the appearance of the coolant. If the coolant has a rusty or muddy appearance, rust is present.

A defective thermostat that remains open will cause slow engine warm-up.

TESTING

COOLING SYSTEM PRESSURE TEST

It is recommended that a cooling system pressure test gauge be used to properly test the system for:

1. Blown or leaking cooling system sealing gaskets.

2. Internal or external coolant leakage.

3. Pressure cap malfunction.

Many types of pressure gauges are available for use. Therefore, it is recommended that the gauge manufacturer's instructions be followed

ENGINE OVERHEATS	1. Radiator fins obstructed. 2. Thermostat stuck closed, or otherwise defective. 3. Cooling system passages blocked by rust, scale or other foreign matter. 4. Belt tension incorrect.	5. Faulty fan drive clutch. 6. Ignition initial timing incorrect. 7. Distributor advance incorrect. 8. Water pump inoperative. 9. Exhaust control valve sticking (except 170 and 200 engine).
ENGINE FAILS TO REACH NORMAL OPERATING TEMPERATURE OR HAS WRONG INDICATED TEMPERATURE	Thermostat stuck open or of incorrect heat range. Temperature sending unit defective (causing gauge to indicate low engine temperature).	Temperature gauge defective (not indicating true engine temperature) or incorrectly installed. Incorrect temperature gauge indication.
LOSS OF COOLANT	Leaking radiator, radiator supply tank, or transmission oil cooler. Loose or damaged hose connections. Water pump leaking. Cylinder head gasket defective. Improper tightening of cylinder head bolts.	Cylinder block core plugs leaking. Cracked cylinder head or block, or warped cylinder head or block gasket surface. Radiator pressure cap defective or wrong type.

FIG. 1— Diagnosis Guide-Cooling System

FAN NOISE WHEN ENGINE IS COLD		
Most Probable Cause	**Action Indicated**	**If Defective**
Slow pump-out of oil from the fluid clutch.	Run engine at 2,000 to 3,000 rpm for 30 to 60 seconds. Fan noise will fade away if operation is normal.	Perform minimum and maximum fan drive requirement check for modulating cycle. Replace if defective.
HIGHWAY FAN NOISE AT ALL TIMES		
Fan clutch not modulating.	Perform minimum and maximum fan drive requirement check for modulating cycle.	Replace fan drive clutch.
FAN NOISE AT HIGH AMBIENT TEMPERATURES: (Over 90° F With A/C on)		
Normal operation.	No test required.	
FAN NOISE WHEN ACCELERATING FROM A STOP AT MODERATE AMBIENT TEMPERATURES: (60° — 90° F With A/C on)		
Normal operation.	No test required.	
ENGINE OVERHEATING		
Fan clutch not performing properly in the maximum cooling range.	Perform maximum fan drive requirement check.	Replace fan drive clutch.

FIG. 2—Diagnosis Guide-Fan Drive Clutch

when performing the test. **Never exceed the rated pressure indicated on the pressure cap when performing the pressure test.**

AUTOMATIC TRANSMISSION OIL COOLER TEST

1. Remove the battery ground strap.
2. Disconnect the transmission oil cooler lines at the radiator connection, and cap the lines to prevent loss of transmission oil.
3. Remove the two straight hose nipple fittings or flare connectors in the inlet and outlet openings of the oil cooler.
4. Fill the radiator to the top of the filler neck with coolant.
5. Install a 1/8-27 or 1/4-18 NPTF pipe plug in one end of the oil cooler and pressurize the opposite end to 50 to 70 PSI air pressure.
6. Observe the coolant in the filler neck area for air bubbles. If air bubbles are evident, the oil Cooler is defective.

THERMOSTAT TEST— THERMOSTAT REMOVED

It is good practice to test new thermostats before installing them in the engine.

Remove the thermostat and immerse it in boiling water. Replace the thermostat if it does not open more than 1/4 inch.

If the problem being investigated is insufficient heat, the thermostat should be checked for leakage. This may be done by holding the thermostat up to a lighted background. Light leakage around the thermostat valve (thermostat at room temperature) is unacceptable and the thermostat should be replaced. It is possible, on some thermostats, that a slight leakage of light at one or two locations on the perimeter of the valve may be detected. This should be considered normal.

MINIMUM FAN DRIVE REQUIREMENT TEST

1. Spin the fan blade. A resistance should be felt. If there is no resistance or very high resistance, the oil in the clutch has been destroyed and the fan clutch must be replaced.
2. Using a suitable marker, mark the water pump pulley hub, one of the fan blade attaching bolts and the crankshaft pulley.
3. Connect a tachometer to the engine.
4. Install a throttle adjusting tool.
5. Connect a Sun Strobe Light. This can be a SLT-1 or SLT-2 Strobotach or a STA-1 Strobe Trigger adapter for the Sun Distributor Test Stand.
6. Start the engine and run it at approximately 1500 rpm until engine temperature has normalized.
7. Adjust the engine to the specified engine testing speed.
8. Operate the Strobe Light at 2000 rpm and aim it at the water pump pulley. Adjust the engine speed until the flashes and the water pump pulley mark are synchronized.
9. Aim the timing light at the fan blade attaching bolts. Adjust the Strobe Light until it is synchronized with the fan blade.
10. The fan speed must not be greater than the specified minimum fan test speed at 2000 water pump rpm.
11. Turn the engine off.
12. If the fan speed was greater than the specified minimum fan test speed, check for proper parts usage.

If the correct parts are used, replace the fan drive clutch.

If the part (s) are not the correct ones, replace the part (s) and perform the test again.

13. If the Maximum Fan Drive Requirement Test is going to be performed, do not remove the tachometer, Strobe Light or throttle adjusting tool.
14. If a Maximum Fan Drive Requirement Test is not going to be performed, remove the tachometer, Strobe Light and Throttle adjusting tool.

MAXIMUM FAN DRIVE REQUIREMENT TEST

1. If the Minimum Fan Drive Requirement Test was not performed, follow steps 1 thru 5 under Minimum Fan Drive Requirement Test.
2. Block off areas on each side of the core in the engine compartment and the front of the grille.
3. Place the air conditioning selector to the maximum position and the blower switch to the high position.
4. Adjust the Strobe Light to 2000 rpm.
5. Start the engine and adjust it until the water pump pulley is synchronized with the Strobe Light. This will be near the engine testing speed given in the specifications.
6. Turn off the air conditioning blower switch.
7. Synchronize the timing light with the marked fan to clutch attaching bolts.
8. The fan speed must meet or exceed the specified maximum fan test speed at 2000 water pump rpm.
9. If the fan speed was less than the specified maximum fan test speed, check for proper parts usage.

If the correct parts are used, replace the fan drive clutch.

If the part (s) are not the correct ones, replace the part (s) and perform the test again.

2 COMMON ADJUSTMENTS AND REPAIRS

ADJUSTMENTS

DRIVE BELTS

The fan drive belt(s) should be properly adjusted at all times. A loose drive belt(s) causes improper alternator, fan and water pump operation. A belt(s) that is too tight places a severe strain on the water pump and the alternator bearings.

Properly tensioned drive belts minimize noise and also prolong service life of the belt. Therefore, it is recommended that a belt tension gauge be used to check and adjust the belt tension. **Any belt that has operated for a minimum of 10 minutes is considered a used belt, and when adjusted, it must be adjusted to the reset tension shown in the specifications.**

Belt Tension

1. Install the belt tension tool on the drive belt (Fig. 3) and check the tension following the instructions of the tool manufacturer.
2. If adjustment is necessary, loosen the alternator mounting and adjusting arm bolts. Move the alternator toward or away from the engine until the correct tension is

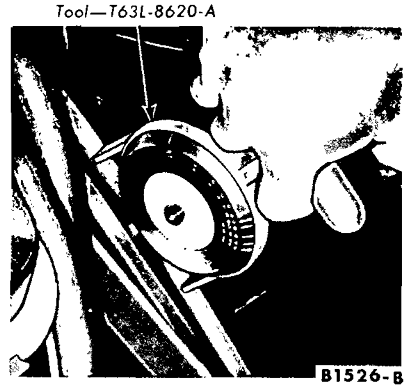


FIG. 3— Checking Drive Belt Tension

obtained. Tighten the alternator adjusting arm and the mounting bolts. Check the belt tension.

REPAIRS

FAN REPLACEMENT

6-Cylinder Engines

1. Loosen the fan belt. Remove the capscrews and lock washers retaining the fan to the water pump hub. Remove the fan.
2. Position the fan on the water pump hub. Install the lock washers and capscrews and torque the capscrews to specifications. Adjust the fan belt.

V-8 Engines

On a car with an air conditioner or extra-cooling radiator, a fan drive clutch may be used. Cars without air conditioning utilize a pulley-to-fan spacer.

1. Remove the radiator upper support and fan guard. Loosen the fan belt. Remove the capscrews and lock washers retaining the fan and spacer (or fan drive clutch) to the water pump hub. Remove the fan and spacer (or fan drive clutch).
2. If equipped with a fan drive clutch, remove the retaining capscrews and lock washers and separate the fan from the drive coupling. Position the replacement fan on the drive clutch and install the lock washers and capscrews.
3. Position the fan and spacer (or drive clutch) on the water pump hub and install the lock washers and capscrews. Torque the capscrews evenly and alternately to specifications. Adjust the fan belt tension to specifications. Install the radiator upper support and fan guard.

FAN DRIVE BELT REPLACEMENT

1. If equipped with power steering, air conditioning and/or Thermactor exhaust emission control system it will be necessary to loosen and remove the drive belts before the fan drive belt can be removed.
2. Loosen the alternator mounting and adjusting arm bolts. Move the alternator toward the engine. Remove the belt(s) from the alternator and crankcase pulleys, and lift them over the fan.
3. Place the belt(s) over the fan. Insert the belt(s) in the water pump pulley, crankshaft pulley and alternator pulley grooves. Adjust the belt tension to specifications.
4. On a car with an air conditioner, install and adjust the compressor drive belt to specifications.
5. On a car with power steering, install the power steering pump drive belt and tighten the pump bracket to the water pump. Adjust the drive belt tension to specifications.

RADIATOR HOSE REPLACEMENT

Radiator hoses should be replaced whenever they become cracked, rotted or have a tendency to collapse.

1. Drain the radiator; then loosen the clamps at each end of the hose to be removed. Slide the hose off the radiator connection and the radiator supply tank connection (upper hose) or the water pump connection (lower hose).
2. Position the clamps at least 1/8 inch from each end of the hose. Slide the hose on the connections. **Make sure the clamps are beyond the bead and placed in the center of the clamping surface of the connections.** Tighten the clamps. Fill the radiator with coolant. Operate the engine for several minutes; then check the hoses and connections for leaks. Check for proper coolant level after the engine has reached normal operating temperature.

THERMOSTAT REPLACEMENT

A poppet-type thermostat is mounted in a recess in the coolant outlet passage at the front of the intake manifold on the V-8 engines. On 6-cylinder engines, the thermostat is located in the coolant outlet passage at the front of the cylinder head. When the thermostat is closed, coolant flows to the water pump through a bypass passage at the front of the engine. When the thermostat is open, coolant flows through the coolant outlet elbow (thermostat housing) to the radiator.

The thermostat used in production is for use with water or permanent-type anti-freeze. A thermostat is also available for use with non-permanent-type anti-freeze or water. For operating temperatures, refer to specifications.

Check the thermostat before installing it following the procedure under "Thermostat Test", Part 11-1.

Do not attempt to repair the thermostat. It should be replaced if it is not operating properly.

Removal

1. Drain the cooling system below the level of the coolant outlet housing.
2. Remove the coolant outlet housing retaining bolts and slide the housing (with the hose attached) to one side.
3. Remove the thermostat and gasket.

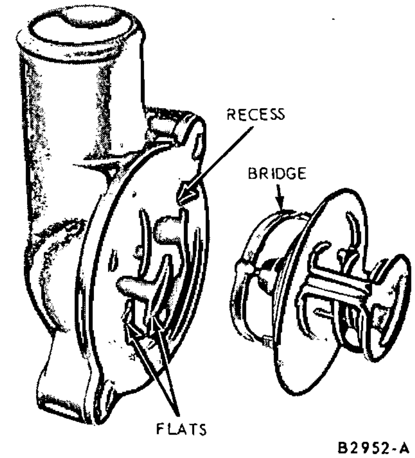


FIG. 4— Installing 6-Cylinder or 289-V8 Thermostat

Installation

1. Clean the coolant outlet housing and cylinder head surface. Coat a new coolant outlet housing gasket with sealer. Position the gasket on the cylinder head or intake manifold (289 V-8). **The gasket must be positioned on the cylinder head or intake manifold before the thermostat is installed. To prevent incorrect installation of the thermostat, the water outlet casting on all six-cylinder and 289 V-8 engines contains a locking recess into which the thermostat is turned and locked. Install this thermostat with the bridge section (Fig. 4) in the outlet casting. Turn the thermostat clockwise to lock it in position on the flats cast into the outlet elbow.**
2. Position the coolant outlet housing and install the retaining screws. Torque the screws to specifications.
3. Fill the radiator. Operate the engine and check for coolant leaks and proper coolant level after the engine reaches normal operating temperature.

AUTOMATIC TRANSMISSION OIL COOLER REPLACEMENT

Replacement of the automatic transmission oil cooler in the radiator tank, is usually performed by radiator specialty shops on a sub-let basis. However, the operation can be performed in a dealer service department, providing proper equipment is available.

The cooler should not be replaced separately except in those cases where an authorized replacement cooler section is available through regular supply channels.

3 CLEANING AND INSPECTION

CLEANING COOLING SYSTEM

To remove rust, sludge and other foreign material from the cooling system, use Rotunda Cooling System Cleanser. Removal of such material restores cooling efficiency and avoids over-heating.

In severe cases where cleaning solvents will not properly clean the cooling system for efficient operation, it will be necessary to use the pressure flushing method.

Various types of flushing equipment are available. If pressure flushing is used, make sure the cylinder head bolts are properly tightened to prevent possible water leakage into the cylinders.

Always remove the thermostat prior to pressure flushing.

A pulsating or reversed direction of flushing water flow will loosen sediment more quickly than a steady flow in the normal direction of coolant flow.

PART 11-2— *Radiator*

1 DESCRIPTION AND OPERATION

The radiators are of the tube and corrugated-fin-core type with the tubes arranged for vertical flow of the coolant. Two header tanks, one on the top and one on the bottom of the radiator provide uniform distribution of the coolant to the tubes. The radiator outlet port (lower header tank) is connected to the water pump inlet port. The radiator inlet port (upper header tank) is connected to the coolant outlet housing of the engine, thereby permitting coolant circulation through the radiator when the thermostat is open.

2 REMOVAL AND INSTALLATION

REMOVAL

1. Drain the cooling system. Disconnect the radiator upper and lower hoses at the radiator.

2. On a car with automatic transmission, disconnect the oil cooler lines at the radiator.

3. Remove the radiator support bolts and remove the radiator.

INSTALLATION

1. If a new radiator is to be installed, remove the drain cock from the old radiator and install it in the new radiator. On a car with automatic transmission, remove the oil cooler line fittings from the old radiator, and install them in the new radiator, using oil-resistant sealer.

2. Position the radiator assembly and install the support bolts.

3. Connect the radiator upper and lower hoses.

On a car with automatic transmission, connect the oil cooler lines.

4. Close the drain cock. Fill and bleed the cooling system.

5. Operate the engine and check for leaks at the hose connections and the automatic transmission oil cooler lines. Check the automatic transmission fluid level.

PART 11-3 Fan Drive Clutch

1 DESCRIPTION AND OPERATION

DESCRIPTION

The fan clutch permits use of a powerful fan without paying the penalty of power loss or noise. It satisfies the need of a mechanical device capable of providing maximum air flow through the radiator when required; providing a minimum air flow when less than maximum cooling is necessary; having the ability to modulate between the maximum and the minimum air flows according to conditions, and limiting fan speed to a maximum rpm, beyond a given engine input speed.

The viscous fluid shear principle in general is applied to fan clutch design in the following manner:

A drive plate totally enclosed within the clutch housing is attached directly to the clutch input shaft (assembled to the water pump shaft and pulley). A predetermined clearance between the drive plate and the inner surfaces of the clutch housing is established at assembly.

The clutch housing and the fan blade assembly are mounted to the input shaft by a sealed bearing and are free to rotate independently of the drive plate and input shaft.

The interior chamber of the clutch housing is filled with a given amount of silicon base oil. Centrifugal force resulting from the rotation of the clutch, coupled with the constant pumping action designed into the unit forces the silicon base oil evenly about the inner surfaces of the clutch in the close clearance or drive area. The drag between the driving and the driven members is thus increased by the presence of the oil, causing the clutch action.

By including a control valve operated by a temperature-sensitive bimetal coil or strip in the air stream on the front of the clutch, the amount of oil pumped in or out of the close clearance (drive) area is regulated. This action determines the fan speed in relation to the drive pulley and the radiator core air flow temperature.

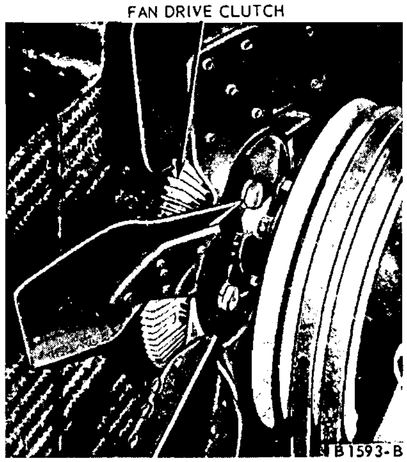


FIG. 1— Typical Fan Drive Clutch Installation

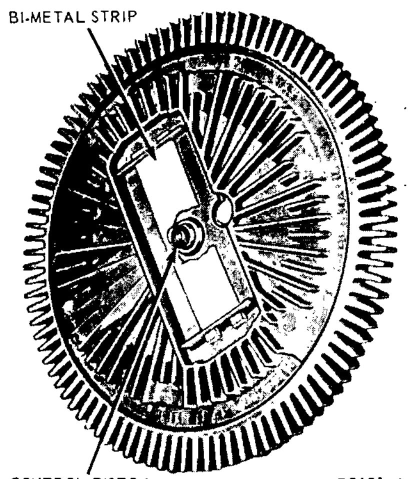


FIG. 2— Fan Drive Clutch With Flat Bi-Metal Spring

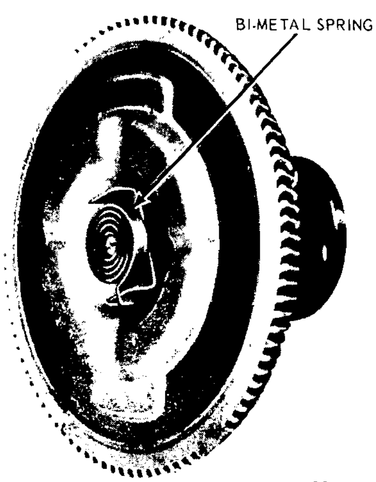


FIG. 3— Fan Drive Clutch With Coil Bi-Metal Spring

OPERATION

START-UP

At start-up, or after a prolonged engine shut-down period, near maximum fan noise can be heard as the fan clutch fluid is forced into the close clearance area by centrifugal force, resulting in maximum application of the clutch. As the normal operating temperature is reached, the amount of fluid allowed to remain in the close clearance area is regulated by the temperature-sensitive control valve. This determines fan speed in relation to the fan drive pulley and the radiator core air flow temperature.

RUNNING-LOW AMBIENT TEMPERATURE

After the initial start-up cycle has been completed, and as long as the air flowing through the radiator core does not exceed 150 ° — 180 ° F temperature, the fan clutch will remain in or near the maximum slip position. During this cycle, the control valve allows a minimum amount of fluid to remain in the close clearance (drive) area.

RUNNING-HIGH AMBIENT TEMPERATURE

As ambient temperatures increase, or air flow temperatures through the core become increasingly higher, additional cooling is required. The bi-metal coil or strip senses this change and moves the control valve to the minimum slip position, retaining a maximum amount of oil in the close clearance area.

MODULATING CYCLE

As vehicle operation varies with heavy to light traffic, terrain, etc., the fan clutch operates within the high and low rpm positions, modulating as required as ambient air flow through the radiator core changes.

HIGH SPEED SUSTAINED OPERATION

During high speed operation, fan clutch action will limit speed of the fan to a given maximum rpm. This will occur under hot or cold conditions.

In some cases a Flex-Fan is used instead of a Fan Drive Clutch. Flexible blades vary the volume of air being drawn through the radiator, automatically increasing the pitch at low engine speeds.

2 REMOVAL AND INSTALLATION

REMOVAL

1. Loosen the fan belt. Remove the capscrews retaining the fan drive clutch to water pump hub (Fig. 4). Remove the fan drive clutch and fan as an assembly.
2. Remove the retaining capscrews and separate the fan from the drive clutch.

INSTALLATION

1. Position the fan on the drive clutch and install and tighten the retaining capscrews evenly and alternately to specifications.
2. Position the fan drive clutch and fan assembly to the water pump hub (Fig. 4). Install and tighten the retaining capscrews evenly and alternately to specifications. Check the fan clutch mounting face for proper alignment.
3. Adjust the fan belt.

PART 11-4 *Specifications*

COOLING SYSTEM CAPACITY

	Approximate Capacity ① (Quarts)	
	U.S. Measure	Imperial Measure
STANDARD COOLING SYSTEM		
170 and 200	9½	8
289	15	12½

① Includes heater. If deleted, subtract one quart.

THERMOSTATS

LOW TEMPERATURE	
OPENS °F	
170 and 200	157°-164°
289	155°-162°
FULLY OPEN	
170 and 200	184°-186°
289	182°
HIGH TEMPERATURE	
OPENS °F	
170 and 200	185°-192°
289	188°-195°
FULLY OPEN	
170 and 200	211°-214°
289	210°-212°

DRIVE BELT TENSION

ALL BELTS	LBS.
New	110–140
Used (any belt operated over 10 minutes)	80–110

TORQUE VALUES

NOTE: All specifications are given in Ft-Lbs. unless otherwise noted.

Water Pump to Cylinder Block (or Cylinder Front Cover)	
All Engines	12–15
Water Outlet Housing	
All Engines	12–15
Fan and Spacer to Pulley Hub	
All Engines	10–15
Fan to Fan Clutch (with a/c)	
All Engines	10–15
Radiator to Front End Sheet Metal	
All Engines	8–13
Radiator to Engine Hose Clamps	
All Engines	1.0–2.5
Transmission Oil Cooler Tube Hose to Radiator	
Fairlane	8–12
Transmission Oil Cooler Tube Nut to Bottom of Radiator	
All Except Fairlane	10–15
Radiator Inlet and Outlet Hose Clamps	
All Engines	1.0–2.5

SPECIAL SERVICE TOOLS

Ford Tool No.	Former Tool No.	Description
T63-8620-A	8620-A	Belt Tension Gauge

RADIATOR AND COOLING FAN IDENTIFICATION

Radiator dimensions are given for the core only; do not measure mounting flanges or header tanks.

Car Engine And Cooling	Radiator Identification Dimensions–Inches				Radiator Service Part Number ①	Fans–Diameter X Blade Width And No. Blades (4)	
	Depth	Height	Width	Fins/In.		w/o Thermactor	w/Thermactor
Comet							
200 Six							
Std. Cool	1.27	17.38	17.24	8	C7OZ-A	15.5 x 1.38 (4)	17 x 1.38 (4)
Std. Cool	1.27	17.38	17.24	10	C7OZ-A	15.5 x 1.38 (4)	17 x 1.38 (4)
Ext. Cool	1.27	17.38	20.24	11	C7OZ-A	17 x 2 (4)	17 x 2 (4)
Ext. Cool	1.27	17.38	20.24	11	C7OZ-A	17 x 2 (4)	17 x 2 (4)
289 V-8							
Std. Cool	1.27	17.38	17.24	10	C7OZ-B	17.5 x 2 (4)	17.75 x 2 (4)
Std. Cool	1.27	17.38	17.24	12	C7OZ-B	17.5 x 2 (4)	17.75 x 2 (4)
Ext. Cool	1.27	17.38	20.24	13	C7OZ-B	17 x 2 (5)	17 x 2 (5)
Ext. Cool	1.27	17.38	20.24	13	C7OZ-B	17.5 x 2 (7)	17.5 x 2 (7)
390 V-8							
Std. Cool	1.27	17.38	23.24	11	C7OZ-C	19 x 2.25 (4)	19 x 2.25 (4)
Std. Cool	1.95	17.38	23.24	10 (GT)	C7OZ-C	18.25 x 2 (7)	18.25 x 2 (7)
Ext. Cool	1.95	17.38	23.24	14	C7OZ-C	18.25 x 2 (7)	18.25 x 2 (7)
Ext. Cool	1.95	17.38	23.24	14	C7OZ-C	18.25 x 2 (7)	18.25 x 2 (7)
Cougar							
289 V-8							
Std. Cool	1.27	16.44	17.24	11	C7ZZ-B	17.5 x 2 (4)	17 x 2 (5)
Std. Cool	1.27	16.44	17.24	11	C7ZZ-B	17.5 x 2 (4)	17 x 2 (5)
Ext. Cool	1.27	16.44	20.24	13	C7ZZ-B	17 x 2 (5)	17 x 2 (5)
Ext. Cool	1.27	16.44	20.24	13	C7ZZ-B	17.5 x 2 (7)	17.5 x 2 (7)
390 V-8							
Std. Cool	1.95	16.0	23.24	8	C7ZZ-C	18.25 x 2 (7)	18.25 x 2 (7)
Std. Cool	1.95	16.0	23.24	9	C7ZZ-C	18.25 x 2 (7)	18.25 x 2 (7)
Ext. Cool	1.95	16	23.24	12	C7ZZ-C	18.25 x 2 (7)	18.25 x 2 (7)
Ext. Cool	1.95	16	23.24	12	C7ZZ-C	18.25 x 2 (7)	18.25 x 2 (7)
Falcon							
170 Six							
Std. Cool	1.27	16.44	17.24	8	C7OZ-A	15.5 x 1.38 (4)	15.5 x 1.38 (4)
Std. Cool	1.27	17.38	17.24	9	C7OZ-A	15.5 x 1.38 (4)	15.5 x 1.38 (4)
Ext. Cool	1.27	17.38	20.24	11	C7OZ-A	17 x 2 (5)	17 x 2 (5)
Ext. Cool	1.27	17.38	20.24	11	C7OZ-A	17 x 1.75 (6)	17 x 1.75 (6)
200 Six							
Std. Cool	1.27	17.38	17.24	8	C7OZ-A	15.5 x 1.38 (4)	15.5 x 1.38 (4)
Std. Cool	1.27	17.38	17.24	10	C7OZ-A	15.5 x 1.38 (4)	15.5 x 1.38 (4)
Ext. Cool	1.27	17.38	20.24	11	C7OZ-A	17 x 2 (5)	17 x 2 (5)
Ext. Cool	1.27	17.38	20.24	11	C7OZ-A	17 x 1.75 (6)	17 x 1.75 (6)

(1) All Service radiators contain an oil cooler unit. When used with standard or overdrive transmission, do not remove oil cooler unit plugs.

RADIATOR AND COOLING FAN IDENTIFICATION (Continued)

Radiator dimensions are given for the core only; do not measure mounting flanges or header tanks.

Car Engine And Cooling	Radiator Identification Dimensions–Inches				Radiator Service Part Number (1)	Fans–Diameter X Blade Width And No. Blades (4)	
	Depth	Height	Width	Fins/In.		w/o Thermactor	w/Thermactor
Falcon (Cont'd) 289 V-8							
Std. Cool	1.27	17.38	17.24	10	C70Z-B	17.5 x 2 (4)	17.75 x 2 (4)
Std. Cool	1.27	17.38	17.24	12	C70Z-B	17.5 x 2 (4)	17.75 x 2 (4)
Ext. Cool	1.27	17.38	20.24	13	C70Z-B	17 x 2 (5)	17 x 2 (5)
Ext. Cool	1.27	17.38	20.24	13	C70Z-B	17.5 x 2 (7)	17.5 x 2 (7)
Fairlane 200 Six							
Std. Cool	1.27	17.38	17.24	8	C70Z-A	15.5 x 1.38 (4)	17 x 1.38 (4)
Std. Cool	1.27	17.38	17.24	10	C70Z-A	15.5 x 1.38 (4)	17 x 1.38 (4)
Ext. Cool	1.27	17.38	20.24	11	C70Z-A	17 x 2 (5)	17 x 2 (5)
Ext. Cool	1.27	17.38	20.24	11	C70Z-A	17 x 1.75 (6)	17 x 1.75 (6)
289 V-8							
Std. Cool	1.27	17.38	17.24	10	C70Z-B	17.5 x 2 (4)	17.75 x 2 (4)
Std. Cool	1.27	17.38	17.24	12	C70Z-B	17.5 x 2 (4)	17.75 x 2 (4)
Ext. Cool	1.27	17.38	20.24	13	C70Z-B	17 x 2 (5)	17 x 2 (5)
Ext. Cool	1.27	17.38	20.24	13	C70Z-B	17.5 x 2 (7)	17.5 x 2 (7)
390 V-8							
Std. Cool	1.27	17.38	23.24	11	C70Z-C	19 x 2.25 (4)	19 x 2.25 (4)
Std. Cool	1.95	17.38	23.24	10 (GT)	C70Z-C	18.25 x 2 (7)	18.25 x 2 (7)
Ext. Cool	1.95	17.38	23.24	14 (427)	C70Z-C	18.25 x 2 (7)	18.25 x 2 (7)
Ext. Cool	1.95	17.38	23.24	14	C70Z-C	18.25 x 2 (7)	18.25 x 2 (7)
Mustang 200 Six							
Std. Cool	1.27	16.44	17.24	9	C7ZZ-A	15.5 x 1.38 (4)	16 x 1.38 (4)
Std. Cool	1.27	16.44	17.24	11	C7ZZ-A	15.5 x 1.38 (4)	16 x 1.38 (4)
Ext. Cool	1.27	16.44	20.24	11	C7ZZ-A	15.5 x 1.38 (4)	16 x 1.38 (4)
Ext. Cool	1.27	16.44	20.24	11	C7ZZ-A	15 x 2 (6)	15 x 2 (6)
289 V-8							
Std. Cool	1.27	16.44	17.24	11	C7ZZ-B	17.5 x 2 (4)	17 x 2 (5)
Std. Cool	1.27	16.44	17.24	11	C7ZZ-B	17.5 x 2 (4)	17 x 2 (5)
Ext. Cool	1.27	16.44	20.24	13 (HP)	C7ZZ-B	17 x 1.75 (4)	17 x 1.75 (4)
Ext. Cool	1.27	16.44	20.24	13	C7ZZ-B	17.5 x 2 (7)	17.5 x 2 (7)
390 V-8							
Std. Cool	1.27	17.38	23.24	11	C7ZZ-C	18.25 x 2 (7)	18.25 x 2 (7)
Std. Cool	1.95	17.38	23.24	10	C7ZZ-C	18.25 x 2 (7)	18.25 x 2 (7)
Ext. Cool	1.95	17.38	23.24	14	C7ZZ-C	18.25 x 2 (7)	18.25 x 2 (7)
Ext. Cool	1.95	17.38	23.24	14	C7ZZ-C	18.25 x 2 (7)	18.25 x 2 (7)

(1) All Service radiators contain an oil cooler unit. When used with standard or overdrive transmission, do not remove oil cooler unit plugs.

FAN CLUTCH TEST SPECIFICATIONS

Car and Engine	Cooling Package	Clutch Part No. (8A616)	Fan Part No. (8600)	Water Pump to Engine Ratio	Engine RPM Req'd to Run. Water Pump 2000 RPM	Fan Test Speed at 2000 Water Pump RPM Max. Slip (Cold)	Fan Test Speed at 2000 Water Pump RPM Min. Slip (Hot)
Comet 200 C.I.D.	A/C+T A/C	C30A-C	C6GE-A	1.18:1	1695	1500	1750
	P.O.	C30A-C	C6GE-A	1.04	1920	1500	1750
289 C.I.D.	A/C+T A/C	C60E-G	C60E-E	1.13:1	1770	1500	1700
	P.O.	C60E-G	C60E-E	1.05	1900	1500	1700
390 C.I.D.	A/C+T A/C	C70E-A	C60E-F	1.34:1	1490	1500	1700
	P.O.	C7ZE-A	C60E-F	.90	2225	1500	1700
Cougar 289 C.I.D.	A/C+T A/C	C7ZE-A	C60E-G	1.25:1	1600	1500	1700
	P.O.	C7ZE-A	C60E-G	1.05	1900	1500	1700
390 C.I.D.	A/C+T A/C	C7ZE-A	C60E-F	1.34:1	1490	1500	1700
	P.O.	C7ZE-A	C60E-F	1.06	1890	1500	1700
Falcon 170 C.I.D.	A/C+T A/C	C30A-C	C6GE-A	1.18:1	1695	1500	1750
	P.O.	C30A-C	C6GE-A	1.04	1920	1500	1750
200 C.I.D.	A/C+T A/C	C30A-C	C6GE-A	1.18:1	1695	1500	1750
	P.O.	C30A-C	C6GE-A	1.04	1920	1500	1750
289 C.I.D.	A/C+T A/C	C60E-G	C60B-G	1.13:1	1770	1500	1700
	P.O.	C60E-G	C60B-G	1.05	1900	1500	1700
Fairlane 200 C.I.D.	A/C+T A/C	C30A-C	C6GE-A	1.18:1	1695	1500	1750
	P.O.	C30A-C	C6GE-A	1.04	1920	1500	1750
289 C.I.D.	A/C+T A/C	C60E-G	C60E-G	1.13:1	1770	1500	1700
	P.O.	C60E-G	C60E-G	1.05	1900	1500	1700
390 C.I.D.	A/C+T A/C	C70E-A	C60E-F	1.34:1	1490	1500	1700
	P.O.	C7ZE-A	C60E-F	.90	2225	1500	1700
Mustang 200 C.I.D.	A/C+T A/C	None	C5ZE-A	–	–	–	–
	P.O.	None	–	–	–	–	–
289 C.I.D.	A/C+T A/C	C7ZE-A	C60E-G	1.25:1	1600	1500	1700
	P.O.	C7ZE-A	C60E-G	1.05	1900	1500	1700
390 C.I.D.	A/C+T A/C	C7ZE-A	C60E-F	1.34:1	1490	1500	1700
	P.O.	C7ZE-A	C60E-F	1.06	1890	1500	1700
Ranchero 200 C.I.D.	A/C+T A/C	C30A-C	C6GE-A	1.18:1	1695	1500	1750
	P.O.	C30A-C	C6GE-A	1.04	1920	1500	1750
289 C.I.D.	A/C+T A/C	C60E-G	C60E-G	1.13:1	1770	1500	1700
	P.O.	C60E-G	C60E-G	1.05	1900	1500	1700
390 C.I.D.	A/C+T A/C	C70E-A	C60E-F	1.34:1	1490	1500	1700
	P.O.	C7ZE-A	C60E-F	.90	2225	1500	1700

P.O.: Power Option.
A/C+T A/C: Air Conditioning with or without Thermactor.

Exhaust System

GROUP
12

PART 12-1— *General Exhaust System Service*

This part covers general exhaust system diagnosis, tests, adjustment and repair procedures. In addition, the cleaning and inspection procedures are covered.

For exhaust system component removal, disassembly, assembly, installation, major repair procedures and specifications, refer to the pertinent part of this group.

Always refer to the Master Parts Catalog for parts usage and interchangeability before replacing a component part of the exhaust system.

1 DIAGNOSIS AND TESTING

DIAGNOSIS

EXHAUST SYSTEM

Exhaust system performance complaints, such as excessive back pressure or a sticking exhaust control valve, are usually noticeable by their effect on engine performance.

An exhaust control valve that is stuck in the open position will result in poor engine performance during initial warm-up, because the heat passing through the intake manifold heat riser is insufficient for proper fuel atomization.

On V-8 engines, if the valve is stuck in the closed position, the intake manifold will be supplied with excessive heat after the initial warm-up period. This will cause poor acceleration, a lack of power, and poor high speed performance.

However, other defective, malfunctioning, or improperly adjusted components have similar effects on engine performance and are characterized by the same symptom or complaint. Thus, for diagnosis of exhaust system problems that affect engine performance, refer to Part 8-1, Section 1.

External leaks in the exhaust system are often accompanied by noises or greyish-white smoke emitted from under the car. Small leaks are usually inaudible and not visible. A visual inspection of the exhaust system usually will show the location of a leak. Look for holes, ruptured joints and eroded areas in the muffler(s), resonator(s), inlet pipe(s) and outlet pipe(s). Examine joints and connections for greyish white deposits that would be caused by exhaust gas leakage.

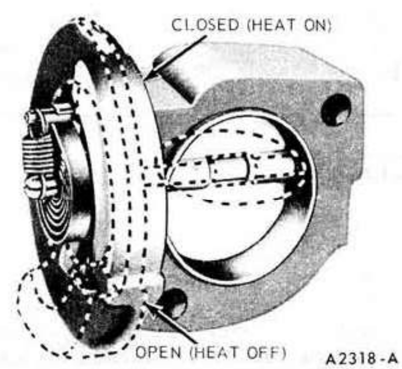


FIG. 1—390 and 427 V-8 Engine Exhaust Control Valve

A misaligned exhaust system is usually indicated by vibration, grounding, rattling, or binding of the components. Often the associated noise is hard to distinguish from other chassis noises. Look for broken or loose clamps and brackets and replace or tighten as necessary. The exhaust system components should be inspected for proper alignment, and the necessary adjustments should be made to maintain the installation clearances shown in Part 12-2. If this does not eliminate the noise (symptom or complaint), examine the chassis for possible location of the problem. Be sure the noise is isolated to and caused by the exhaust system before replacing any of the components.

TESTING

EXHAUST CONTROL VALVE

Check the thermostatic spring of the valve to make sure it is hooked on the stop pin. To check the exhaust control valve on the car, make sure the spring holds the valve closed. Actuate the counterweight by hand to make sure it moves freely through approximately 90° of rotation without binding.

The closed and open positions of the exhaust control valve for the 390 and 427 V-8 are shown in Fig. 1.

The valve is closed when the engine is cold. However, a properly operating valve will open when very light finger pressure is applied to the

counterweight. Rapidly accelerate the engine to make sure the valve momentarily opens. The valve is designed to open when the engine is at normal operating temperature and is operated at high rpm.

2 COMMON ADJUSTMENTS AND REPAIRS

ADJUSTMENTS

The exhaust system must be free of leaks, binds, grounding and excessive vibration.

Exhaust system vibration, grounding or binds are usually caused by: loose, broken or improperly aligned clamps, or brackets, or improperly connected pipes. Any of the aforementioned conditions may cause changes to clearances of the exhaust system components. If any of these conditions exist, the exhaust system components must be checked, adjusted or replaced to make certain the specified clearances (refer to the illustrations in Part 12-2) are maintained.

EXHAUST SYSTEM ALIGNMENT

Refer to the pertinent illustration in Part 12-2 for the clearance specifications and location of components. Perform the following procedure to adjust the exhaust system components:

1. Loosen the pipe connection clamps and the pipe support bracket clamp(s). Loosen the inlet pipe to exhaust manifold retaining nuts.
2. Torque the exhaust manifold to inlet pipe retaining nuts evenly and alternately to specification to insure uniform pressure on the seal and inlet pipe flange.
3. Work from the front of the car toward the rear and progressively adjust the exhaust system components and clamps at the various pipe connections to relieve binds and improper pipe connections. **Be sure the inlet and outlet pipes and mufflers are aligned so that all clearances are within the limits shown on the illustrations in Part 12-2.** Then torque the clamps to specification.
4. Check the exhaust system for leaks..

REPAIRS

EXHAUST CONTROL VALVE MAINTENANCE

Refer to the 1967 Passenger Car Maintenance and Lubrication Manual, Form 7920C-67, for the recommended maintenance mileage interval.

The exhaust control valve, if the car is so equipped, should be periodically checked to make certain it is operating properly. A valve that is stuck in the open position will result in poor engine performance during initial warm-up, because the heat passing through the intake manifold heat riser is insufficient for proper fuel atomization.

On V-8 engines, if the valve is stuck in the closed position, the intake manifold will be supplied with excessive heat after the initial warm-up period. This will cause poor acceleration, a lack of power, and will cause poor high speed performance in general.

Lubricate the valve with FoMoCo Exhaust Control Valve Solvent (COAZ-19A501-A).

MUFFLERS, INLET PIPES AND OUTLET PIPES

Brackets, clamps and insulators should be replaced if they are defective or become badly corroded. Do not attempt repair of these parts.

3 CLEANING AND INSPECTION

EXHAUST SYSTEM

INSPECTION

Inspect the inlet pipe(s), outlet pipe(s), resonator(s) and muffler(s) for cracked joints, broken welds and corrosion damage (holes) that would result in a leaking exhaust system. Inspect the clamps, brackets and insulators for cracks and stripped or badly corroded bolt threads. When pipe clamp(s) are loosened and/or removed to replace a pipe, muffler or resonator, replace the clamp(s), if there is reasonable doubt that its service life is limited.

Check the exhaust control valve. Be sure the thermostatic spring is hooked on the stop pin. Move the counterweight by hand to make sure it moves freely throughout its normal travel range (approximately 90° of rotation).

PART 12-2— Exhaust Pipes, Mufflers and Control Valve

1 DESCRIPTION

The exhaust systems for the various car models are shown in Figs. 1 through 8.

SINGLE EXHAUST SYSTEMS

The single exhaust system on cars with a six cylinder engine (Figs. 1 through 3) consists of a muffler inlet pipe and muffler assembly and outlet pipe.

The single exhaust system on cars with a 289 V-8 engine (Figs. 1 through 3) consists of a Y-type muffler inlet pipe, muffler and outlet pipe. Except the Mustang and Cougar which also has a resonator assembly.

The single exhaust system for the Fairlane and Mercury Intermediate with a 390 V-8 engine (Fig. 4 & 5) consists of a Y-type muffler inlet pipe, inlet pipe extension, and a muffler with integral outlet pipe.

DUAL EXHAUST SYSTEMS

The dual exhaust system for the Fairlane and Mercury Intermediate with a 390 and 427 V-8 engine (Fig. 6) consists of an H-type muffler inlet pipe and an integral inlet pipe extension and muffler and outlet pipe assembly for each side and a resonator.

The dual exhaust system for the Mustang with a 289 4-V, 390 4-V high performance engine and Cougar 390 V-8 (Fig. 7 and 8) consists of a H-type muffler inlet pipe, resonator, mufflers, and outlet pipe assemblies.

The location and type of exhaust system gaskets, retaining clamps and loop-type support brackets are shown in the respective exhaust system illustrations. The loop-type support brackets eliminate tension on the supports due to thermal expansion of the system.

2 REMOVAL AND INSTALLATION

The replacement procedures given apply to all car models and to right and left assemblies on dual and single exhaust systems unless otherwise noted. Typical exhaust systems for the various car models are shown in Figs. 1 through 8.

EXHAUST CONTROL VALVE REPLACEMENT—390, 427 V-8

SEDANS, CONVERTIBLES, AND STATION WAGONS

Removal

1. Remove the retaining bolts or clamps securing the muffler(s) and outlet pipes to the support bracket and insulator assemblies and rear support bracket(s) (Fig. 4 thru 8).
2. Temporarily support the muffler, inlet pipe and outlet pipe assembly(ies) with soft wire.
3. Remove the nuts securing the inlet pipe to both exhaust manifolds.
4. Pull the inlet pipe rearward and remove the exhaust control valve and all mounting gaskets. Discard the gaskets.
5. Clean the exhaust control valve and the flanges of the exhaust manifolds and inlet pipe. Replace all defective or damaged parts.

Installation

1. Position the exhaust control valve over the studs of the right exhaust manifold (Fig. 4 thru 8). Place new gasket(s) on the inlet pipe flange(s).
2. Install the muffler inlet pipe on the exhaust manifolds. Install the retaining nuts and loosely tighten.
3. Attach the mufflers and outlet pipes to the support bracket and insulator assembly(ies) and loosely tighten the bolts or clamps.
4. Position muffler outlet pipes to the rear support brackets and loosely install the retaining clamps.
5. Remove the temporary support wire.
6. Adjust the exhaust system components to conform to the clearance specifications. Properly position the respective clamps and brackets. Working from the front of the exhaust system toward the rear, progressively torque the retaining bolts, nuts and clamps to specifications.
7. Check the exhaust system for leaks.

SINGLE EXHAUST SYSTEMS

MUFFLER ASSEMBLY (EXCEPT 390 V-8 SEDAN AND STATION WAGON)

Removal

1. Raise the vehicle on a hoist.
2. Remove the clamp retaining the muffler assembly to the inlet pipe.
3. Remove the clamp retaining the rear hanger and outlet pipe to the muffler.
4. Separate the muffler from the inlet pipe and the outlet pipe and hanger from the muffler and remove the muffler.

Installation

1. Position the muffler to the inlet pipe, outlet pipe, and muffler rear hanger and install the clamps.
2. Adjust the system to the clear-

ance specifications (Fig. 1 thru 4). Then tighten the clamp nuts to specifications.

3. Lower the vehicle and check the exhaust system for leaks.

OUTLET PIPE (EXCEPT 390 V-8 SEDAN AND STATION WAGON)

Removal

1. Raise the vehicle and remove the clamps at the rear of the muffler and at the outlet pipe support bracket.
2. Support the muffler and separate the outlet pipe from the muffler.

Installation

1. Position the outlet pipe to the muffler and support brackets, and install the clamps.
2. Adjust the exhaust system to the clearance specifications. Then, torque the clamp nuts and screws to specification.
3. Lower the vehicle and check the exhaust system for leaks.

MUFFLER AND OUTLET PIPE ASSEMBLY — 390 V-8 SEDAN AND STATION WAGON

Removal

1. Remove the inlet pipe clamp at the muffler assembly.
2. Remove the bolts or clamp attaching the outlet pipe to the rear support bracket. Remove the clamp that retains the muffler assembly to the support bracket (if so equipped).
3. Support the inlet pipe with soft wire. Separate the muffler from the inlet pipe and remove the muffler and outlet pipe assembly.
4. Replace any damaged parts.

Installation

1. Position the muffler and outlet pipe assembly onto the inlet pipe, and install the inlet pipe to muffler clamp.
2. Install the bolts or clamp that retain the muffler assembly to the rear support bracket and rear muffler support bracket snug, but not tight.
3. Adjust the exhaust system and torque the retaining bolts and clamps to specifications. Remove the temporary support wire.
4. Lower the car and start the engine and check the exhaust system for leaks.

RESONATOR AND INLET PIPE ASSEMBLY — MUSTANG AND COUGAR 289-V8

Removal

1. Loosen the inlet pipe clamp at the muffler (Fig. 3) and slide it forward.
2. Loosen the inlet pipe clamp at the Y-inlet pipe. Support the inlet pipe with soft wire.
3. Separate the inlet pipe from the muffler and from the Y-inlet pipe, and remove the inlet pipe and resonator assembly.
4. Replace any damaged parts.

Installation

1. Position the inlet pipe and resonator assembly to the Y-inlet pipe and to the muffler (Fig. 3). Position the retaining clamps the specified distance from the end of of the pipe, and tighten them snug, but not tight.
2. Adjust the exhaust system and torque the clamps to specifications.
3. Remove the temporary support wire. Lower the car and start the engine and check the exhaust system for leaks.

INLET PIPE—6-CYLINDER ENGINES

Removal

1. Remove the inlet pipe to muffler assembly clamp (Figs. 1 through 3). Temporarily support the muffler with soft wire. Remove the clamp securing the inlet pipe to engine bracket.
2. On convertibles, remove the front floor lower crossmember plate.
3. Remove the nuts that secure the inlet pipe to the exhaust manifold. Remove the inlet pipe.
4. Clean the gasket surface of the exhaust manifold.
5. Discard the gasket and replace any damaged parts.

Installation

1. Install a new gasket on the inlet pipe flange (Figs. 1 through 3).
2. Install the inlet pipe to the muffler assembly and exhaust manifold and install the retaining nuts on the studs of the manifold snug, but not tight. Position the inlet pipe to muffler retaining clamp.
3. Position the inlet pipe to engine bracket retaining clamp. Remove the temporary support wire.
4. Adjust the exhaust system components to conform to the clearance specifications. Working from the front of the car toward the rear, progressively torque the retaining nuts and clamps to specifications.

On convertibles, install the front floor lower crossmember plate.

5. Lower the car and start the engine and check the exhaust system for leaks.

INLET PIPE—V-8 ENGINES

Removal

1. Loosen the clamp at the inlet pipe to the muffler assembly and slide it rearward (Figs. 1 through 5).
2. On convertibles, remove the front floor lower crossmember plate. Temporarily support the muffler assembly in position with soft wire.
3. Remove the retaining nuts securing the inlet pipe to exhaust manifolds. Slide the inlet pipe off of the muffler assembly and remove the inlet pipe from the exhaust manifolds.

On sedans and station wagons with a 390 V-8, remove the exhaust control valve from the right exhaust manifold.

4. Clean the gasket surfaces of the exhaust manifolds, inlet pipe and exhaust control valve (if so equipped). Discard the gaskets and replace any damaged parts.

Installation

1. Install new gaskets on the inlet pipe flanges (Figs. 1 through 5).

On sedans and station wagons with a 390 V-8, place the exhaust control valve on the right exhaust manifold.

2. Install the inlet pipe on the exhaust manifolds, and install the retaining nuts on the manifold studs snug, but not tight.
3. Connect the inlet pipe to the muffler assembly and position the clamp. Tighten all clamps snug, but not tight. Remove the soft wire used to temporarily support the inlet pipe extension.

On convertibles, install the front floor lower corssmember plate.

4. Adjust the exhaust system components to conform to the clearance specifications. Working from the front of the car toward the rear, progressively torque the nuts and retaining clamps to specifications.
5. Lower the car and start the engine and check the exhaust system for leaks.

DUAL EXHAUST SYSTEMS

INLET PIPE—FAIRLANE AND MERCURY INTERMEDIATE WITH 390 AND 427 V-8 ENGINES

Removal

1. Raise the vehicle on a hoist.
2. Remove the two clamps retaining the inlet H pipe to the right and left muffler inlet pipes.
3. Remove the nuts retaining the inlet pipe assembly to the right and left exhaust manifolds. Break the inlet pipes loose and remove the inlet pipe from the vehicle. Discard the gaskets.
4. Clean the gasket surfaces on the exhaust manifolds.

Installation

1. Position the new gaskets and inlet pipe assembly to the muffler inlet pipes and exhaust manifolds and install and tighten the exhaust manifold retaining nuts.
2. Position the exhaust inlet pipe to the muffler inlet pipe clamps and tighten them.
3. Lower the vehicle on the hoist and check the exhaust system for leaks.

MUFFLER—FAIRLANE AND MERCURY INTERMEDIATE WITH 390 AND 427 V-8 ENGINES

Removal

1. Raise the vehicle on a hoist.
2. Remove the clamp(s) retaining the muffler(s) inlet pipe(s) to the H-pipe.
3. Remove the clamp(s) retaining the rear hanger(s) and outlet pipe(s) to the muffler(s).
4. Separate the muffler inlet pipe(s) from the H-pipe (Fig. 6), and remove the muffler(s).

Installation

1. Position the muffler(s) to the H-pipe, outlet pipe, and muffler rear hanger and install the clamps.
2. Adjust the system to the clearance specifications in Fig. 6. Then, torque the clamp nuts to specification.
3. Lower the vehicle and check the exhaust system for leaks.

RESONATOR—FAIRLANE AND MERCURY INTERMEDIATE WITH 390 AND 427 V-8 ENGINES

Removal

1. Raise the vehicle on a hoist.
2. Remove the clamps retaining the outlet pipes to each end of the resonator.
3. Separate the outlet pipes from the resonator and remove the resonator from the vehicle.

Installation

1. Position the resonator to the outlet pipes with the drain hole on the bottom (Fig. 6) and install the clamps.
2. Adjust the outlet pipes to the specifications shown in Fig. 6 and tighten the clamps. Then, torque the clamp nuts to specification.
3. Lower the vehicle and check the exhaust system for leaks.

OUTLET PIPE(S)—FAIRLANE AND MERCURY INTERMEDIATE WITH 390 AND 427 V-8 ENGINES

Removal

1. Raise the vehicle and remove the clamps at the rear of the muffler(s) and at the resonator.
2. Support the muffler(s) and resonator and remove the outlet pipe support bracket clamp(s).
3. Separate the outlet pipe(s) from the resonator and muffler(s) and remove the outlet pipe(s).

Installation

1. Position the outlet pipe(s) to the muffler(s), resonator, and support bracket(s). Install the support bracket clamps as shown in Fig. 6.
2. Install the clamps at the resonator and at the muffler(s). Be sure the muffler support bracket is inserted under the clamp.
3. Adjust the outlet pipe(s) to the clearance specifications shown in Fig. 6 and torque the clamps to specification.
4. Lower the vehicle and check the exhaust system for leaks.

MUFFLER—MUSTANG AND COUGAR DUAL EXHAUST

Removal

1. Remove the clamps, retaining the inlet pipes to the muffler (Fig. 7 and 8).
2. Remove the support bracket clamp(s) from the outlet pipe(s).
3. Separate the inlet pipe(s) from the muffler and remove the muffler and outlet pipes from the vehicle.

Installation

1. Position the muffler to the inlet pipes and install the clamps snug.
2. Position the outlet pipes to the support brackets and install the clamps snug.
3. Adjust the muffler and pipes for the specified clearance (Fig. 7 and 8) and tighten the clamps.
4. Start the engine and check the exhaust system for leaks.

RESONATOR—MUSTANG AND COUGAR DUAL EXHAUST

Removal

1. Remove the clamps retaining the inlet pipe(s) to the muffler (Fig. 7 and 8).
2. Remove the clamps retaining the inlet pipe extension(s) to the H-pipe.
3. Remove the support bracket(s) to resonator(s) attaching bolts.
4. Separate the inlet pipe(s) from the muffler and the inlet pipe extension(s) from the H-pipe and remove the resonator(s).

Installation

1. Position the resonator(s) to the H-pipe and install the clamp(s) snug, but not tight.
2. Position the inlet pipe(s) to the muffler and install the clamp(s) snug, but not tight.
3. Position the resonator(s) to the support bracket(s) and install the attaching bolts.
4. Adjust the exhaust system to specification (Fig. 7 and 8).
5. Start the engine and check the exhaust system for leaks.

OUTLET PIPE(S) AND EXTENSION(S) — MUSTANG 390 V-8

Removal

1. Remove the outlet pipe to muffler clamp.
2. Remove the outlet pipe extension to the rear support bracket clamp.
3. Remove the outlet pipe and extension from the muffler. Replace any damaged or defective parts.

Installation

1. Position the outlet pipe and extension to the muffler and loosely install the retaining clamp.
2. Position the outlet extension to the rear support bracket and loosely install the retaining clamp.
3. Align the outlet pipe to conform to clearance specifications and torque the clamps to specifications.
4. Lower the car and inspect the system for leaks.

H PIPE (MUFFLER INLET PIPE) — MUSTANG AND COUGAR 390 V-8

Removal

1. Raise the car. Remove the clamps retaining the H-pipe to the muffler assemblies.
2. Remove the nuts retaining the H-pipe to the exhaust manifolds. Free up the H-pipe and remove the pipe from the car.
3. Clean the exhaust manifold surfaces. Discard the gaskets. Replace any damaged or defective parts.

Installation

1. Position gasket on the H-pipe flanges. Position the H-pipe to the exhaust manifold and loosely install the retaining nuts.
2. Position the H-pipe to the muffler assemblies and loosely install the retaining clamps.
3. Align the system to conform to clearance specifications and torque all nuts and clamps to specifications.
4. Lower the car and inspect the system for leaks.

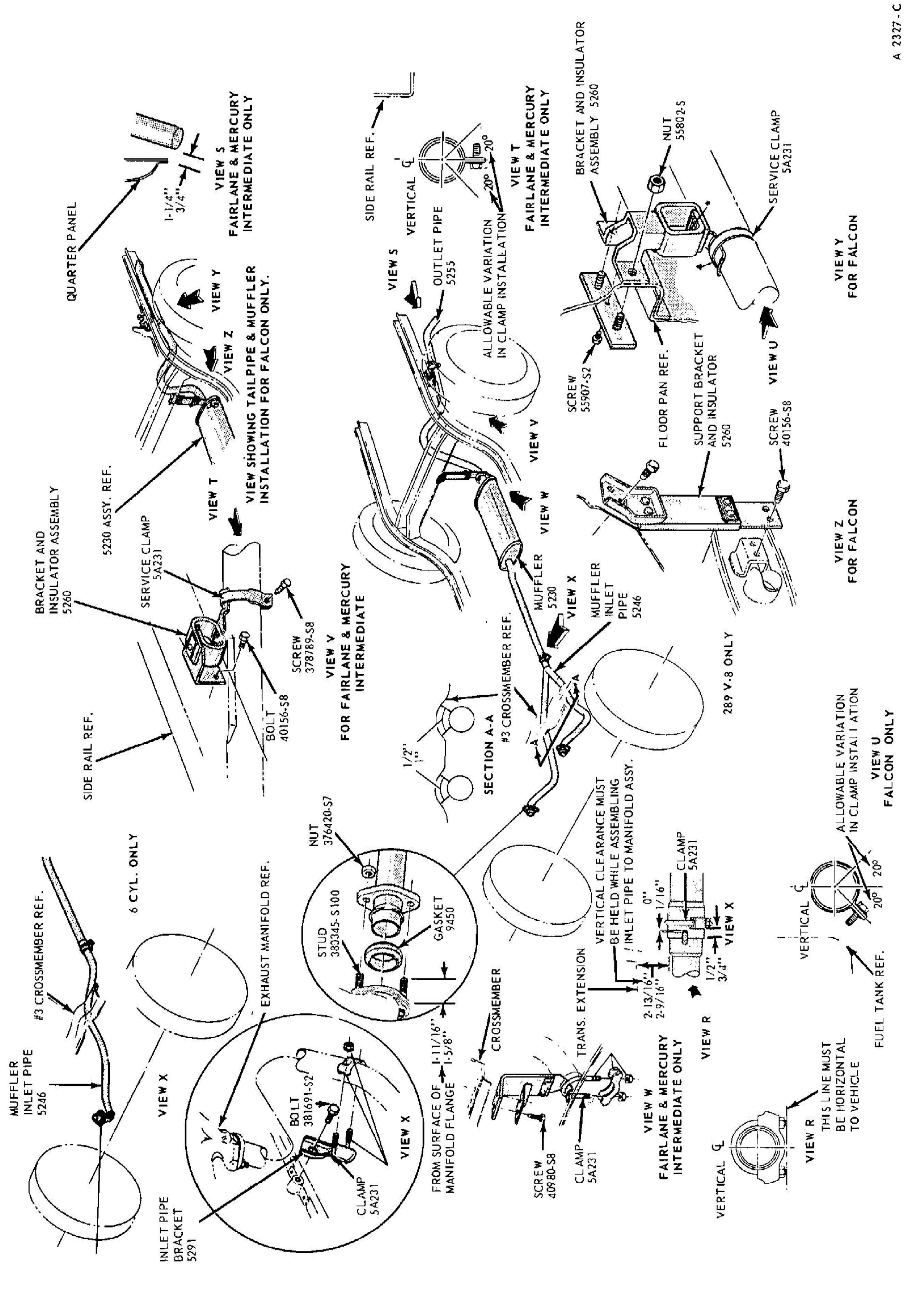


FIG. 1—Falcon, Fairlane, Mercury Intermediate Single Exhaust System — Six and 289 V-8 Sedan and Convertibles

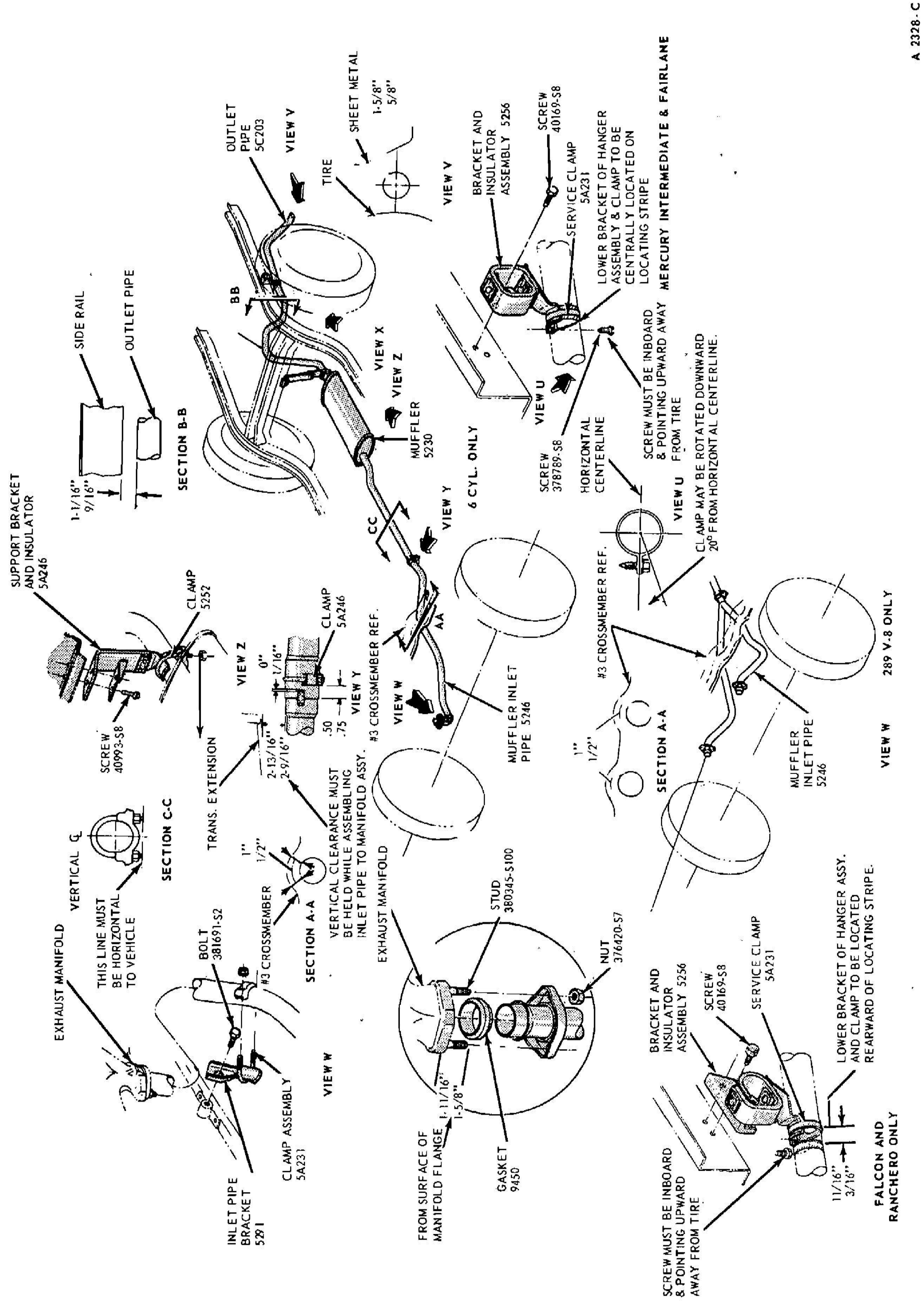


FIG. 2—Falcon, Fairlane, *Mercury* Intermediate Single Exhaust System — Six and 289 V-8 Station Wagon and Ranchero

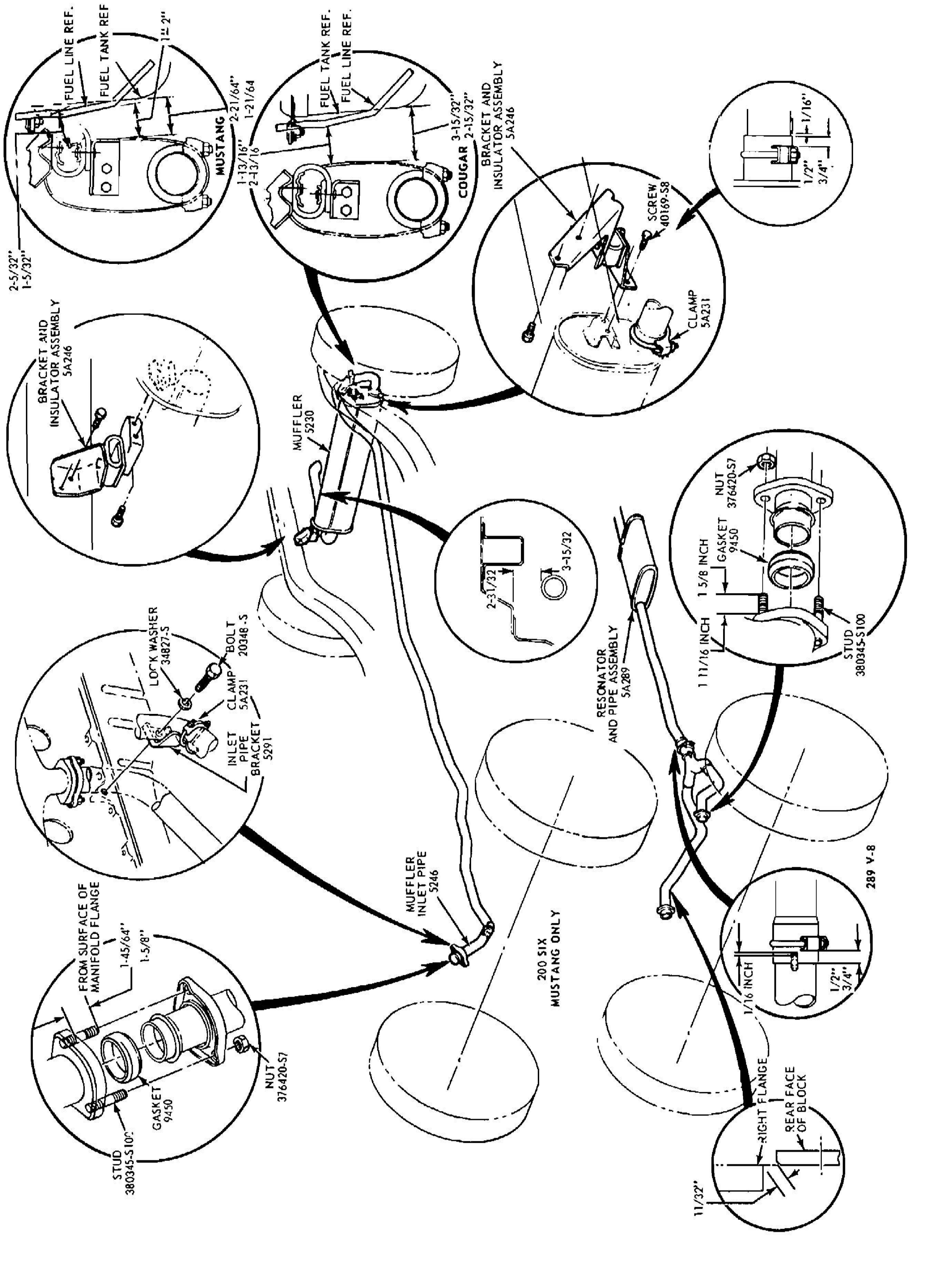
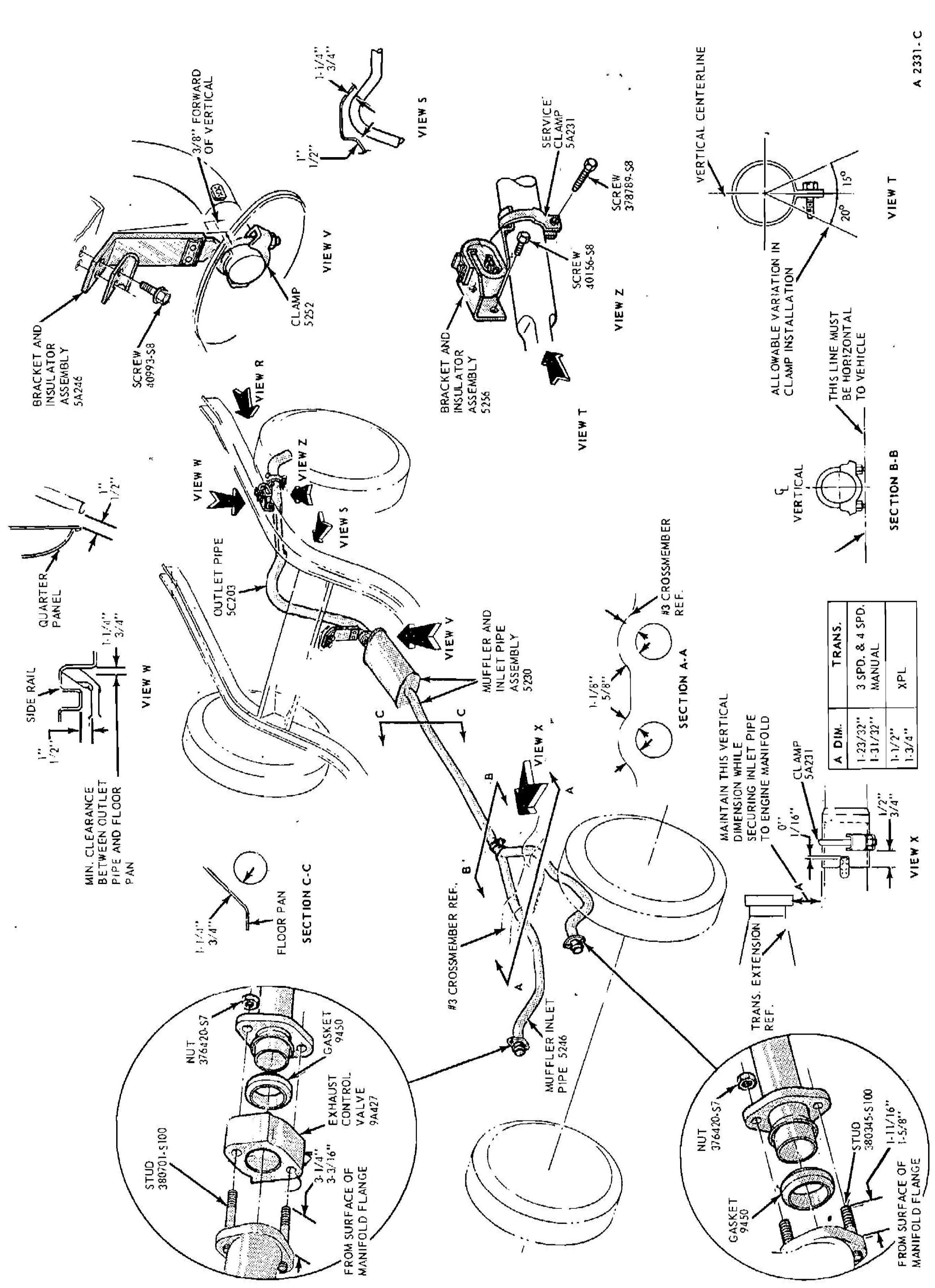


FIG. 3—Cougar and Mustang Single Exhaust System — 200 Six and 289 V-8



A DIM.	TRANS.
1-23/32" 1-31/32"	3 SPD. & 4 SPD. MANUAL
1-1/2" 1-3/4"	XPL

FIG. 4—Fairlane and Mercury Intermediate Single Exhaust System — 390 2-V Sedan

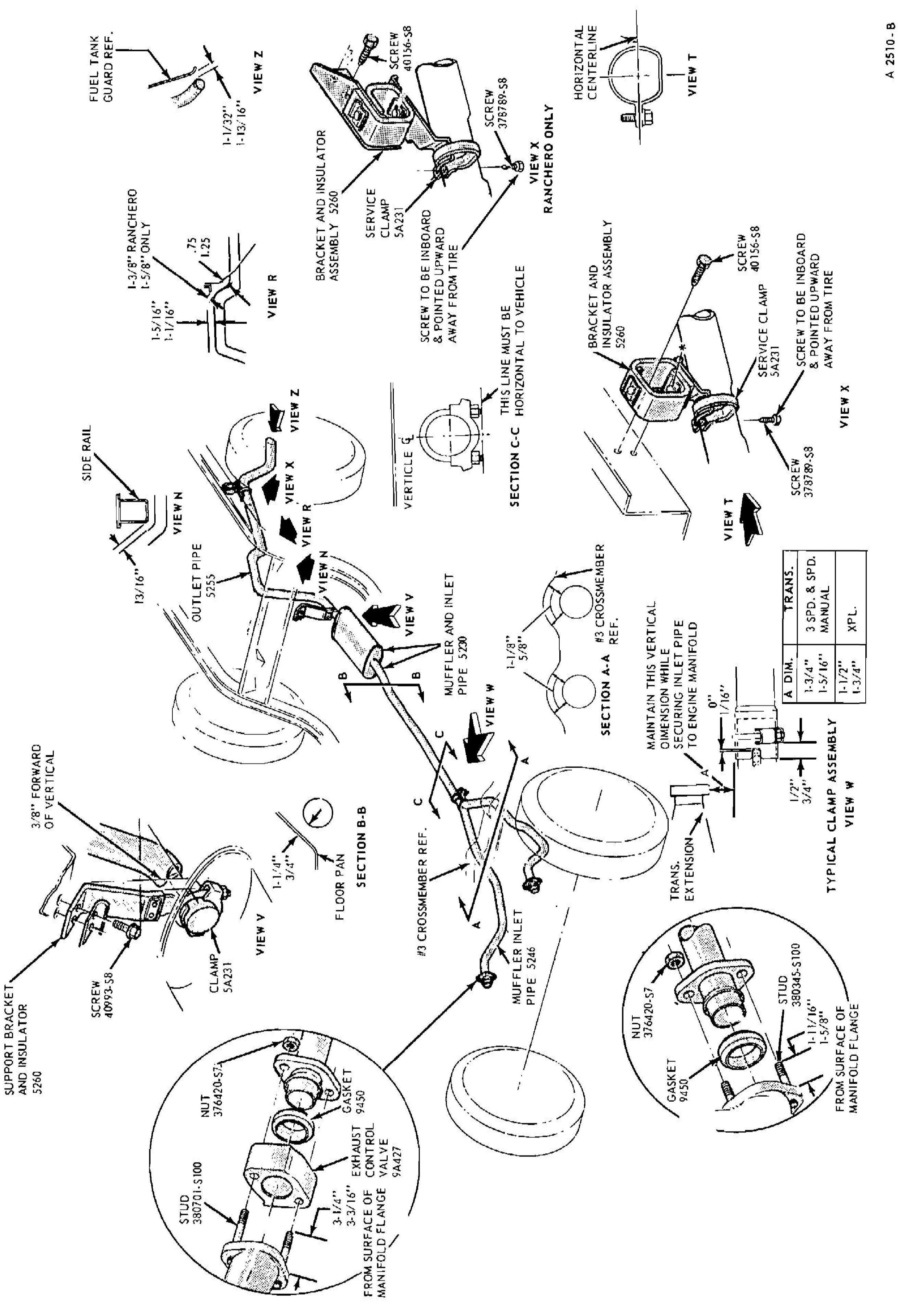
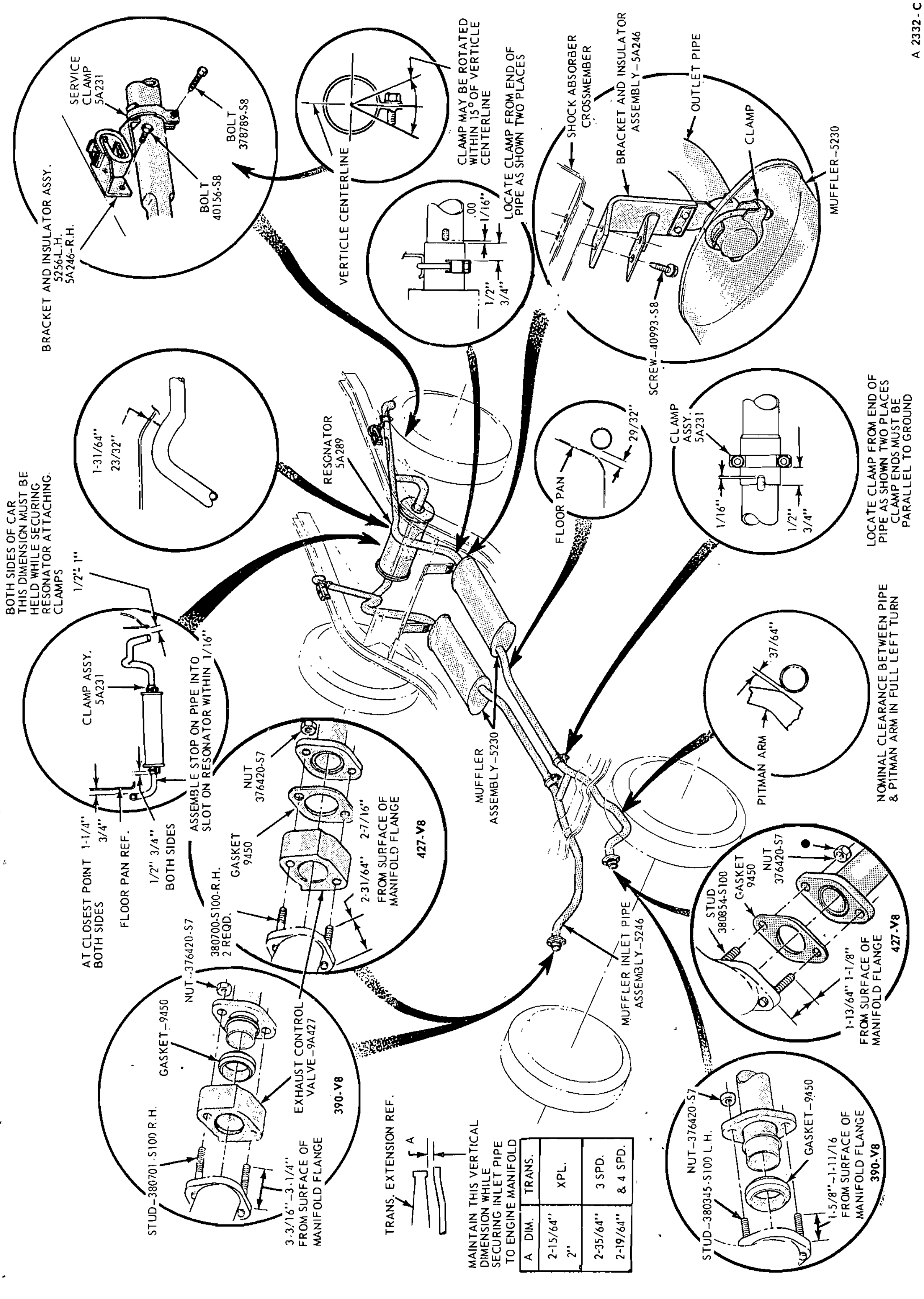


FIG. 5—Fairlane and Mercury Intermediate Single Exhaust System — 390 V-8 Station Wagon and Ranchero



A DIM.	TRANS.
2-15/64" 2"	XPL.
2-35/64" 2-19/64"	3 SPD. & 4 SPD.

FIG. 6—**Fairlane and Mercury Intermediate Dual Exhaust System — 390 and 427 V-8 Sedan and Convertible**

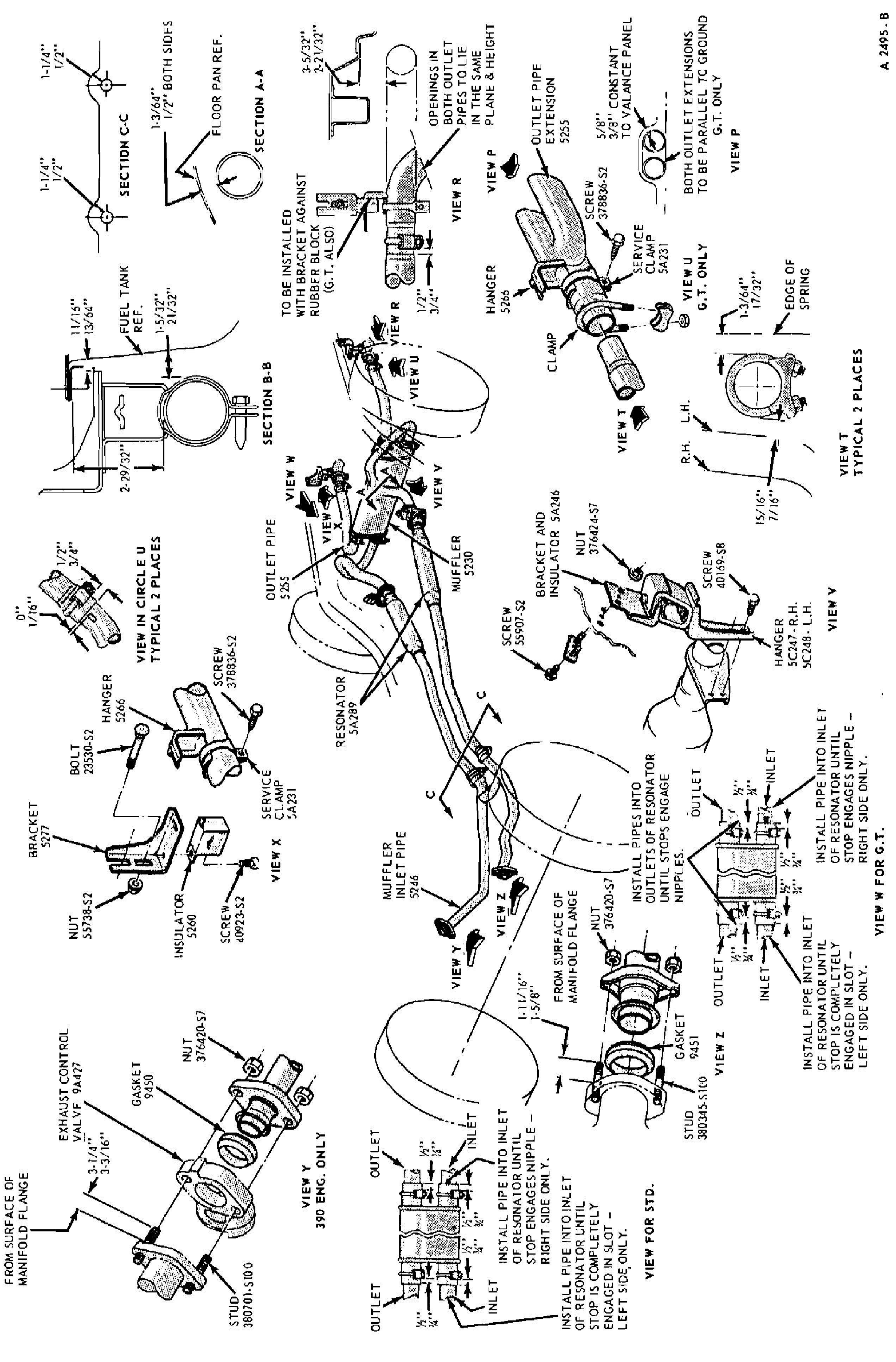


FIG. 7—Mustang Dual Exhaust System — 289 4-V and 390 V-8

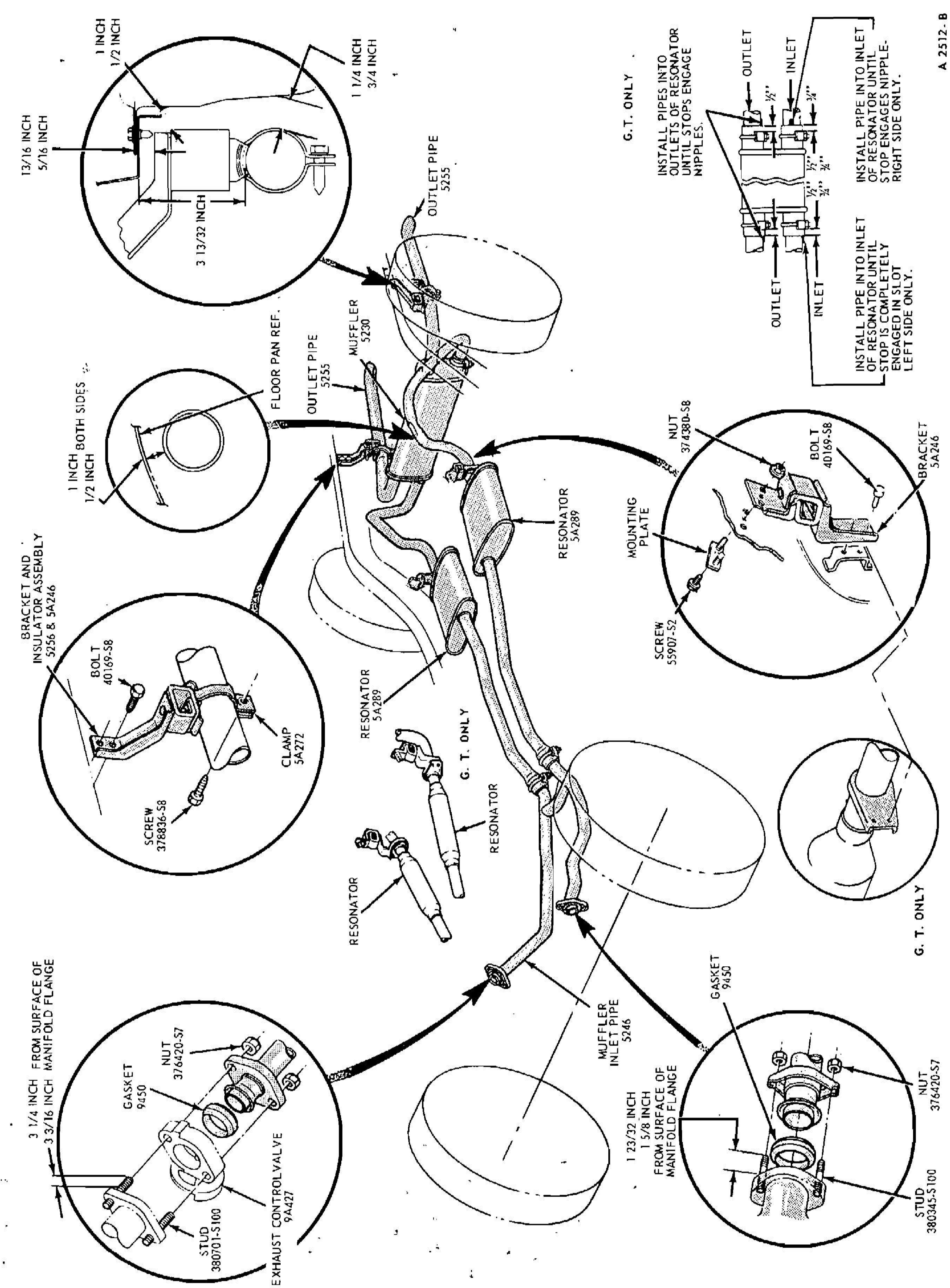


FIG. 8—Cougar Dual Exhaust System

PART 12-3— *Specifications*

TORQUE LIMITS

	Ft-lbs
Inlet Pipe (s) to Manifold (s) – Nuts	25-35
Inlet Pipe to Engine Bracket – Clamp (6 Cylinder)	20-28
Inlet Pipe Bracket to Engine – Bolt (6 Cylinder)	17-22
Inlet Pipe to Muffler – Clamp (Except Fairlane, Mercury-Intermediate 427 V-8)	20-28
Inlet Pipe to Muffler – Clamp (Fairlane, Mercury-Intermediate 427 V-8)	14-22
Inlet Pipe to Resonator – Clamp	20-28
Resonator Support Bracket – Nuts (Mustang, Cougar Dual Exhaust)	14-22
Outlet Pipe to Extension – Clamp (Mustang GT Only)	20-28
Muffler Support Bracket – Clamp (Except Fairlane, Mercury-Intermediate 427 V-8 and Falcon)	20-28
Muffler Support Bracket – Clamp (Fairlane, Mercury-Intermediate 427 V-8)	14-22
Outlet Pipe Support Bracket – Nuts (Falcon Only)	14-22

LUBRICANTS	FORD PART NO.
Exhaust Control Valve Lubricant	COAZ-19A501-A, R-149-A

Charging System

GROUP **13**

PART 13-1—*General Charging System Service*

1 DIAGNOSIS

The charging system consists of an alternator, alternator regulator, battery, charge indicator light or gauge, and the necessary wiring to connect the components (Fig. 1 or 2). Refer to the Wiring Diagram Book Form 7795-67 for the schematics on the Leece Neville system.

Battery discharge is not always due to charging system defects. Excessive use of lights and accessories while the engine is either off or running at low idle; corroded battery cables and connectors; low water level in the battery; or prolonged disuse of the battery, which would permit self-discharge; are all possible reasons which should be considered when a battery is run down or low in charge.

Charging system troubles such as low alternator output, no alternator output (indicated by the indicator light being on or the indicator gauge showing discharge continuously while the engine is running), or alternator output voltage too high, require testing of both the alternator and the alternator regulator.

Use the Rotunda Alternator-Regulator Tester A-RE20-22 as an aid in charging system problem diagnosis.

Alternator regulator failures are usually not recognized except by the direct effect on the alternator output and, of course, eventual battery overcharge or discharge. As the regulator is the control valve for the alternator, it acts to protect the battery by preventing excessive voltage output. Discharge of the battery to ground through the alternator is prevented by the diodes of the alternator which permit current flow in one direction (to the battery) only. Proper adjustment of the two units in the alternator regulator (field relay and voltage limiter), is very important.

The trouble diagnosis guide (Fig. 15), along with the following procedures, will assist in a logical sequence of pinpointing specific troubles. **Always determine the cause of failure as well as making the repair. Do not ground the field circuit at the alternator or at the regulator, or the regulator will be damaged.**

SLOW CRANKING AND HEADLIGHTS DIM AT IDLE

Refer to Fig. 15 for these symptoms.

Using the Rotunda Battery Starter Tester, perform a Battery Capacity Test by loading the battery to three times its ampere hour rating for 15 seconds. If the total battery voltage is less than 9.6 volts, check the specific gravity of each cell. If there is less than 50 points (0.050) difference between cells, the battery is low in charge. If the specific gravity test shows more than 50 points between cells, the battery is defective. If battery voltage was above 9.6 volts, perform a Starter Cranking Circuit Test. Use any Rotunda voltmeter and measure the voltage drop in the four parts of the cranking circuit. If the voltage is greater than specified, the cable connections are corroded or the cables are defective. Clean the battery connections or replace battery cables.

Check the drive belt for proper tension. Adjust it if necessary.

Use any Rotunda voltmeter and perform a Battery Drain Test. Any voltage indicates the possibility of a regulator field relay closed, an alternator positive diode shorted, lighting or other circuit in continuous operation, or pinched or grounded wiring. Repair or replace parts as required.

Use any Rotunda voltmeter to measure the alternator voltage output at 2000 rpm. Set the voltage limiter to specification. If the owner used the vehicle for short trips or has extended periods at idle, set the voltage limiter to the high side of the specification.

Using Rotunda equipment, perform the Alternator Output Test. Repair the alternator if necessary.

Secure information from the customer concerning excessive use of accessories. Instruct the customer in proper usage of the battery.

CHARGE INDICATOR GAUGE— NO READING OR GAUGE OPERATES IN REVERSE

Refer to Fig. 15 for these symptoms. Either of two different type indicator gauges may be encountered. One type of gauge has external loops on the back of the gauge. The gauge wire is routed through these loops with no physical connection to the gauge. The other type gauge uses external terminal post connections. In this case, the gauge wire is connected to the terminal posts.

To test the charge indicator gauge, turn the headlights ON with the engine off. The indicator pointer should move toward the D or discharge portion of the scale. The test for indication in the charge direction is made by first turning on the lights for about two minutes (engine not running), and then running the engine at about 1500 rpm. Turn the lights off and observe the pointer travel. If charge is indicated, the indicator is satisfactory.

If no movement of the needle is obtained, check the loop (or connections) on the rear of the gauge to see if the battery to alternator wire passes inside the loop (or the connections are tight). If the wire is in the loop (or the connections are

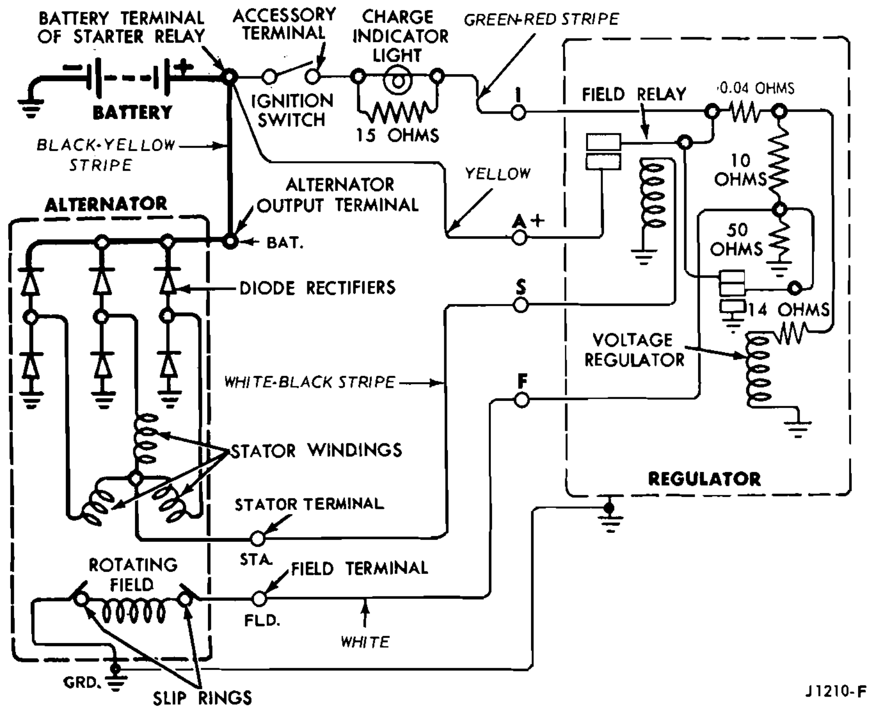


FIG. 1—Autolite Alternator System With Indicator Light

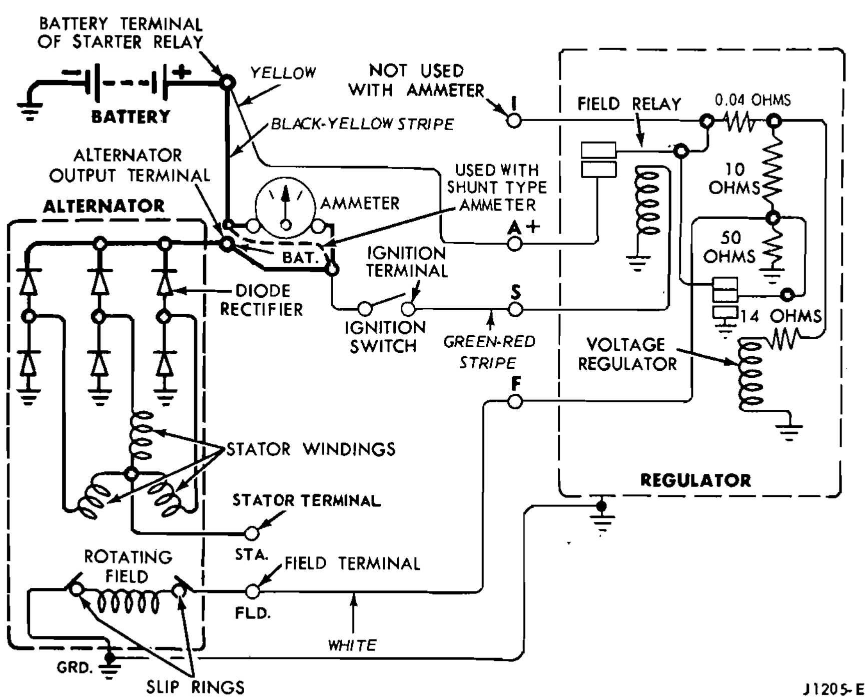


FIG. 2—Autolite Alternator System With Ammeter

tight) and the gauge does not indicate a charge or discharge, the gauge is inoperative.

If the pointer moves toward the C or charge portion of the scale when the headlights are first turned ON, the wire passes through the loop in the wrong direction (or the wire connections are reversed). Feed the wire through the loop in the opposite direction (or reverse the wires on the terminals), observing the precaution of disconnecting the battery before working under the instrument panel.

CHARGE INDICATOR LIGHT STAYS ON

Refer to Fig. 15 for this symptom. Other symptoms covered under this heading are: charge indicator gauge indicates constant discharge; battery will not hold charge; alternator has no output; alternator has low output. Check for a broken, loose or slipping drive belt. Inspect battery, cables and charging system wiring for good electrical contact. Clean the battery terminals and tighten all connections as necessary. Check the battery specific gravity. Charge the battery and perform the battery tests. Replace the battery if necessary.

If the owner has had previous difficulty with the battery running down and past history does not indicate that the problem is due to excessive night driving, excessive use of accessories, short trips or extended periods of idle, check the complete charging system. Use the Rotunda Alternator-Regulator Tester A-RE20-22 as an aid in charging system problem diagnosis.

CHECK ALTERNATOR OUTPUT

Test the alternator output at the battery (Section 2 Testing). With the ammeter in series between the battery cable and battery post, it is necessary to add 2 amperes to the output reading obtained to cover the current draw of the standard ignition system and 6 amperes for the transistor ignition system.

An output of 2 to 5 amperes less than that specified usually indicates an open diode. An output of approximately 10 amperes less than that specified usually indicates a shorted diode.

CHECK VOLTAGE LIMITER

Check the voltage limiter setting, and check the closing voltage of the field relay (the voltage at which the field relay contacts just make contact). Adjust the voltage limiter and/or the field relay if their settings are out of specification.

On some cars the location of the regulator may prevent adjustment on the car. Remove the regulator to an alternator-regulator test stand if adjustment is necessary.

The field relay used with the transistorized voltage regulator is a sealed unit and is not to be adjusted. To determine its closing voltage, follow the procedure given in Section 2 Testing, under Autolite Regulator and Circuit Tests.

If the regulator was adjusted properly, check the green-red wire from the accessory terminal of the ignition switch through the charge indicator light and 15-ohm resistor to the voltage regulator, and the white-black wire from the voltage regulator to the alternator. Repair or replace as necessary.

With the engine at 1000 rpm, the voltage produced at the STA terminal of the alternator should be 6 volts or more. A voltage less than 6 volts may be caused by an open negative diode.

CHECK CHARGING CIRCUIT RESISTANCE

Perform the Circuit Resistance Tests (Section 2 Testing). To check the battery to field wiring, connect the field rheostat between the battery positive terminal and the alternator FLD terminal and repeat the alternator output test. If the alternator now has good output the wire from the battery terminal of the starter relay to the FLD terminal of the alternator is defective. **Failure to remove the regulator connector plug (or wire leads on Leece Neville system), for this test will result in burned regulator contacts.** If the alternator still has no output it is defective. Remove the alternator and perform the bench tests. Replace defective parts. Visually check the alternator to regulator harness for shorts to ground, caused by worn insulation or rubbed or pinched wires. Use the Rotunda Alternator Regulator Tester for the Autolite system.

CHECK THE 15-OHM RESISTOR (VEHCILES WITH INDICATOR LIGHT)

Disconnect the regulator terminal plug. Connect a No. 1155 bulb between the I terminal of the plug and ground. Turn the ignition switch on. If the 1155 bulb does not light, the 15-ohm resistor is defective. Replace the resistor if it is defective.

LIGHTS AND FUSES FAIL PREMATURELY, SHORT BATTERY LIFE

Refer to Fig. 15 for these symptoms. Other symptoms covered under this heading are: battery uses excessive amount of water; burning of distributor points, ignition resistor wire, or coil; high battery charging rate.

Visually check the alternator regulator mounting to the body, including the regulator ground wire at the regulator for loose or corroded connections. Clean and tighten connections and mountings.

Use any Rotunda voltmeter measure alternator voltage output at 2000 rpm. Adjust the voltage limiter or replace the regulator if it cannot be adjusted.

ALTERNATOR NOISY

Refer to Fig. 15 for this symptom. When investigating the complaint of alternator noise, first try to localize the noise area to make sure that the alternator is at fault rather than the alternator belt, water pump, or another part of the vehicle. Start the engine and use a stethoscope or similar sound detector instrument to localize the noise. An alternator bearing, water pump bearing or belt noise is usually evidenced by a squealing sound.

An alternator with a shorted diode will normally whine (magnetic noise) and will be most noticeable at idle speeds. Perform the alternator output test. If the output is approximately 10 amperes less than that specified, a shorted diode is usually indicated.

To eliminate the belt(s) as the cause of noise, check the belt(s) for bumps, apply a light amount of belt dressing to the belt(s). If the alternator belt is at fault, adjust the belt to specification, or replace the belt if necessary.

If the belt(s) is satisfactory and the noise is believed to be in the alternator or water pump, remove the alternator belt. Start the engine and listen for the noise as a double check to be sure that the noise is not caused by another component. Use this test and the sound detector test to isolate the offending unit. If the noise is traced to the alternator, remove it and inspect the bearings for wear, shaft scoring, or an out-of-round condition. Visually inspect the alternator machined surfaces on both housings

and on the stator core. Check for improper assembly of core to housings. Repair or replace the alternator.

CHARGE INDICATOR LIGHT FLICKERS OR CHARGE INDICATOR GAUGE FLUCTUATES

Refer to Fig. 15 for this symptom. This condition may be caused by dirty or oxidized regulator contacts, loose or damaged connections in the charging system wiring harness, worn brushes, or improper brush tension.

At certain engine speeds the ammeter needle will fluctuate to some degree when voltage regulation is just starting, and when the turn signals are in operation, which is normal.

Use the Rotunda Volt-Amp-Alternator Tester and perform the alternator Circuit Resistance Tests. Resistance higher than that specified indicates loose connections or damaged wiring.

Use any Rotunda voltmeter to measure the alternator voltage output at 2000 rpm. Erratic voltage output indicates dirty or oxidized regulator contacts.

Use the Rotunda Volt-Amp-Alternator Tester and perform a Transistor Regulator Field Relay Test. Observe for erratic operation of the relay.

Remove the alternator, inspect the brush length and check the brush spring tension, and condition of the slip rings.

Use any Rotunda voltmeter and measure the alternator stator neutral voltage. Voltage below specification indicates an open negative diode.

2 TESTING

ALTERNATOR TESTS

Refer to Wiring Diagram Manual From 7795P-67 for locations of wiring harnesses. Schematics are shown in Group 19 of the manual. Use **care when connecting any test equipment to the alternator system, as the alternator output terminal is connected to the battery at all times.**

ALTERNATOR OUTPUT TEST—ON ENGINE

When the alternator output test is conducted off the car, a test bench must be used. Follow the procedure given by the test bench equipment manufacturer. **When the alternator is removed from the car for this purpose always disconnect a battery cable as the alternator output connector is connected to the battery at all times.**

To test the output of the alternator on the car, proceed as follows:

1. Place the transmission in neutral or park **and apply the parking brake.** Make the connections as shown in Fig. 3 or 4. Be sure that the field resistance control is at the OFF position at the start of this test.

2. Close the battery adapter switch. Start the engine, then open the battery adapter switch.

3. Increase the engine speed to approximately 2000 rpm. Turn off all lights and electrical accessories.

4. Turn the field rheostat clockwise until 15 volts is indicated on the voltmeter. Turn the master control clockwise until the voltmeter indicates between 11 and 12 volts. Holding the master control in this position turn the field rheostat clockwise to its maximum rotation. Turn the master control counterclockwise until the voltmeter indicates 15 volts. Observe the ammeter reading. Add 2 amperes to this reading when the car is equipped with standard ignition or 6 amperes with the transistor ignition system, to obtain total alternator output. If rated output cannot be obtained increase the engine speed to 2900 rpm and repeat this step.

5. Return the field resistance control to the maximum counterclockwise position, release the master control, and stop the engine. Disconnect the test equipment, if no further tests are to be made.

An output of 2 to 5 amperes below specifications usually indicates an open diode rectifier. An output of approximately 10 amperes below specifications usually indicates a shorted diode rectifier. An alternator with a shorted diode will usually whine, which will be most noticeable at idle speed.

AUTOLITE STATOR NEUTRAL VOLTAGE TEST—ON ENGINE

The Autolite alternator STA terminal is connected to the stator coil neutral or center point (see Figs. 1 and 2). The voltage generated at this point is used to close the field relay in the charge indicator light system.

To test for the stator neutral voltage, connect the voltmeter positive lead to the STA terminal and connect the negative lead to ground. Start the engine and run it at 1000 rpm. Turn off all lights and accessories. The voltage indicated on the meter should be 6 volts or more.

FIELD OPEN OR SHORT CIRCUIT TEST—ON BENCH

Make the connection as shown in Figs. 3 or 4. The current draw, as indicated by the ammeter, should be to specifications. If there is little or no current flow, the field or brushes have a high resistance or are open. A current flow considerably higher than that specified above, indicates shorted or grounded turns or brush leads touching. If the test showns that the field is shorted or open and the field brush assembly or slip rings are not at fault, the entire rotor must be replaced.

If the alternator has output at low rpm and no output at high rpm, centrifugal force may be causing the rotor windings to short to ground. Put the alternator on a test stand and repeat the preceding test. Run the alternator at high speed during the test.

DIODE TEST—ON BENCH

Disassemble the alternator and disconnect the diode assembly from the stator and make the test connections as shown in Figs. 5 or 6.

To test the negative diodes contact one probe to the diode plate as shown and contact each of the three stator lead terminals with the other probe. Reverse the probes and repeat the test. Test the positive diodes in the same way.

All of the diodes should show a low reading of approximately 60 ohms in one direction and infinite reading (no needle movement) with the probes reversed. **Be sure to use the Rotunda ohmmeter with the multiply-by knob at 10.**

OPEN OR GROUNDED STATOR COIL TESTS—ON BENCH

These tests are made to verify that the stator coil is defective. Disassemble the stator from the alternator and rectifier assembly for these tests.

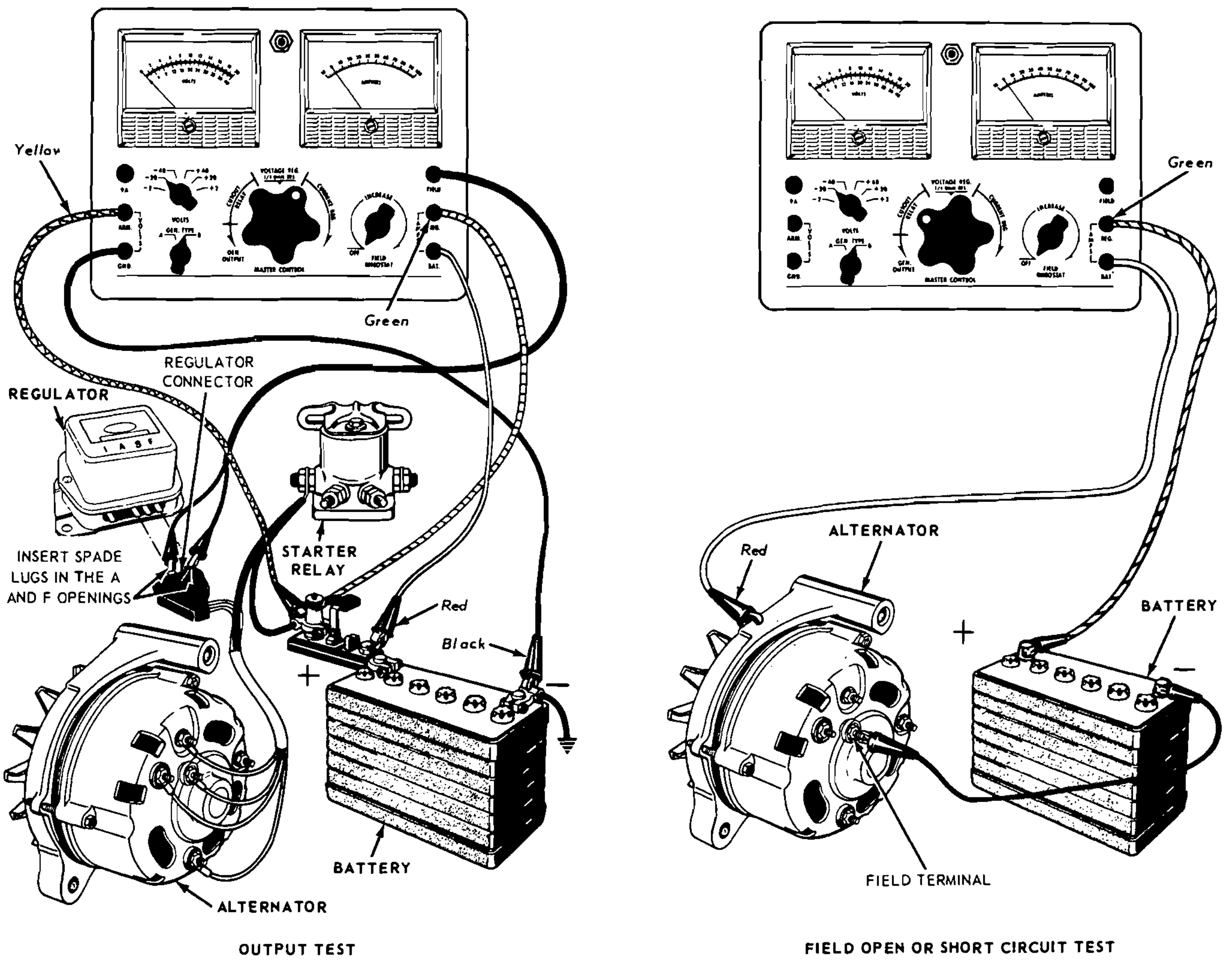


FIG. 3—Alternator Tests—Autolite

Open Stator Test—On Bench

Set the Rotunda ohmmeter multiply-by knob at 1. Connect the ohmmeter between each pair of stator leads. If the ohmmeter does not show equal readings between each pair of stator leads, the stator is open and must be replaced.

Grounded Stator Test—On Bench

Set the Rotunda ohmmeter multiply-by knob at 1000. Connect the ohmmeter between one of the stator leads and the stator core. Be sure that the test lead makes a good electrical connection to the core. The ohmmeter should not show any continuity, if it does, the stator winding is grounded and must be replaced.

ALTERNATOR REGULATOR AND CIRCUIT TESTS

CIRCUIT RESISTANCE TESTS

For the purpose of this test, the resistance values of the circuits have been converted to voltage drop readings for a current flow of 20 amperes.

Alternator to Battery Positive Terminal

To check the alternator to battery ground terminal voltage drop, make the connections as shown in Fig. 7 or 8. Turn off all electrical accessories and lights. Close the battery adapter switch, start the engine, then open the battery adapter switch. Increase the engine speed to 2000 rpm. Adjust the field rheostat until the ammeter indicates 20 amperes. Note the voltmeter reading at this point. The voltage reading should be no greater than 0.3 volt on a car with a charge indicator light and 0.5 volt on a car with an ammeter.

These voltage drops have been computed for a standard car. The current used by any auxiliary, continously operating, heavy-duty equipement will not show on the ammeter and will have to be taken into account when making this test.

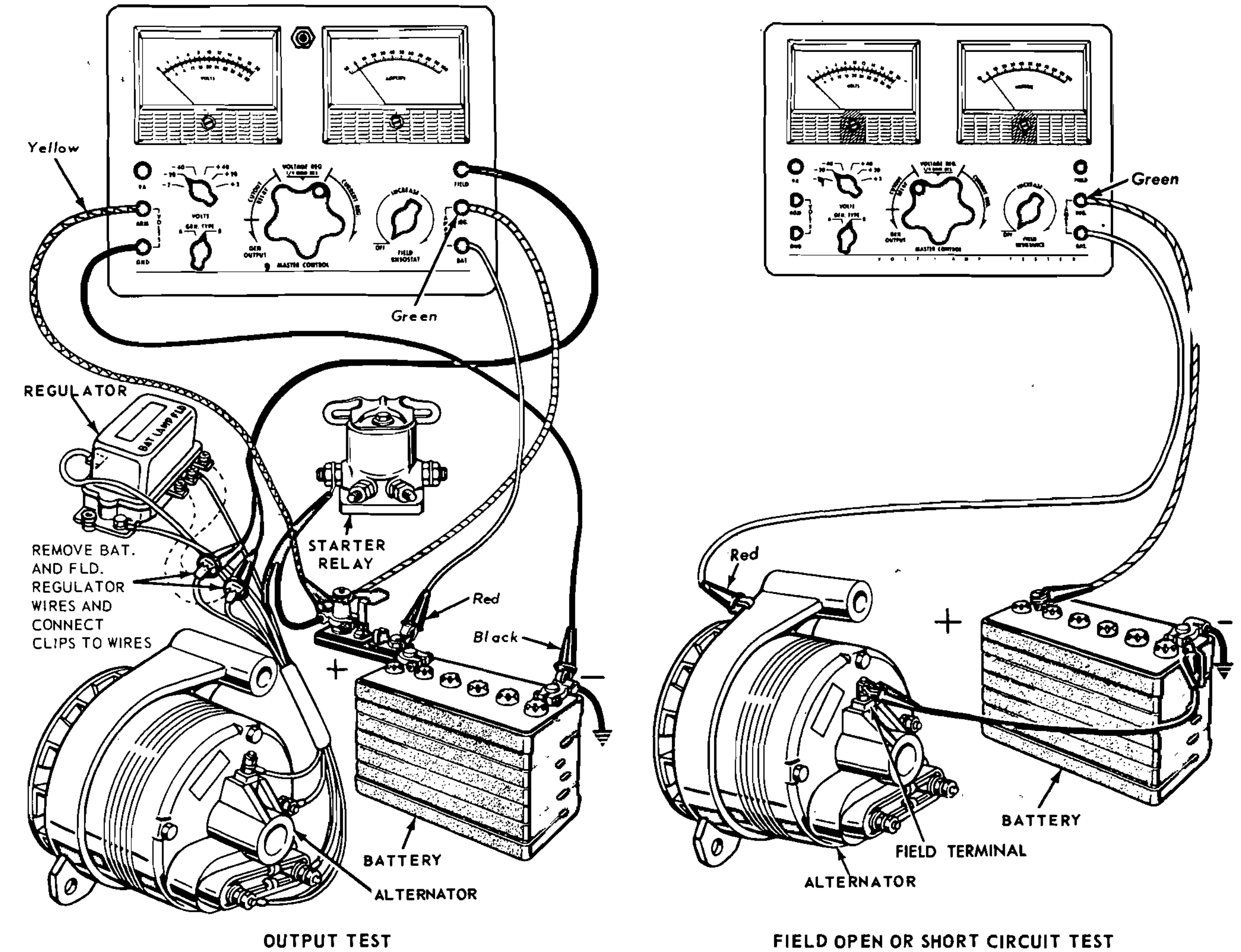


FIG. 4—Alternator Tests—Leece Neville

Alternator to Battery Ground Terminal

To check the alternator to battery positive terminal voltage drop, make the connections as shown in Fig. 7 or 8. Close the battery adapter switch, start the engine and open the adapter switch. Maintain the engine speed at 2000 rpm. Adjust the field rheostat until the ammeter indicates 20 amperes. The voltage indicated on the voltmeter should be less than 0.1 volt.

REGULATOR TESTS

Voltage Limiter Test

Voltage limiter calibration tests must be made with the regulator cover in place and the regulator at normal operating temperature (equivalent to the temperature after 20 minutes of operation on the car with the hood down).

For accurate voltage limiter testing, the battery specific gravity must be at least 1.225. If the battery is low in charge, either charge it to 1.225 specific gravity or substitute a fully charged battery, before making a voltage limiter test.

To test the voltage regulator on the car, make the test connections to the battery as shown in Fig. 9. Turn all accessories off, including door operated dome lights. Close the battery adapter switch, start the engine, then open the adapter switch. Attach a voltage regulator thermometer to the regualtor cover. Operate the engine at approximately 2000 rpm for an additional 5 minutes.

When the battery is charged, and the voltage regulator has been temperature stabilized, the ammeter should indicate less than 10 amperes with the master control set at the 1/4-OHM position.

Cycle the regulator as follows (mechanical regualtors only): turn the ignition key to OFF to stop the engine, close the adapter switch, start the engine, and open the adapter switch. Increase the engine speed to 2000 rpm. Allow the battery to normalize for about one minute, then read the voltmeter. Read the thermometer, and compare the voltmeter reading with the voltage given in Fig. 10 for the ambient temperature indicated on the thermometer. If the regulated voltage is not within specifications, remove

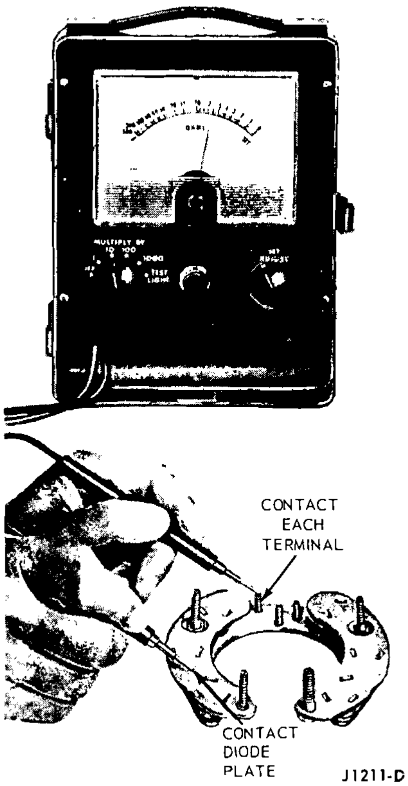


FIG. 5—Autolite Diode Test

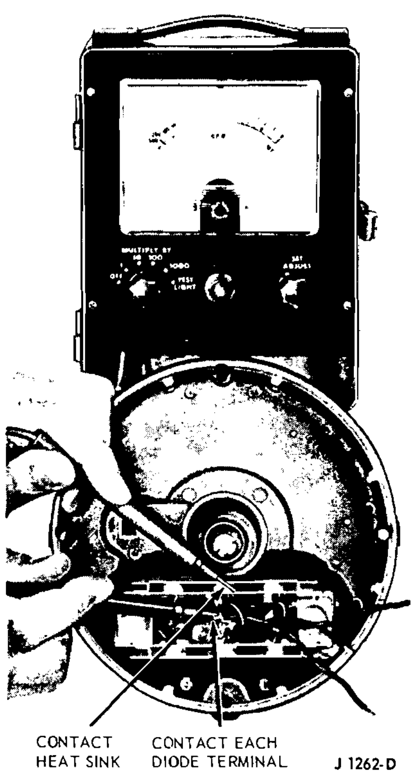


FIG. 6—53-Ampere Leece Neville Diode Test

the regulator to an alternator regulator test stand and make a voltage limiter adjustment (Part 13-3). After each adjustment, be sure to cycle the regulator before each reading (mechanical regulator only). **The readings must be made with the cover in place (mechanical regulator only).**

On some cars the location of the regulator may prevent adjustment on the car. Remove the regulator to an alternator-regualtor test stand if adjustment is necessary.

Field Relay Test—Mechanical Regulator

Remove the regulator from the car, and remove the regulator cover. Make the connections as shown in Fig. 11 or 12. Slowly rotate the field rheostat control clockwise from the maximum counterclockwise position until the field relay contacts close. Observe the voltmeter reading at the moment that the relay contacts close. This is the relay closing voltage. If the relay closes immediately, even with the field rheostat close to the maximum counterclockwise position, push the red button between the two meters, and repeat the test. If the closing voltage is not to specifications, adjust the relay (Part 13-3).

Field Relay Test—Transistor Regulator

Disconnect the relay connector plug. Make the connections as shown in Fig. 11. Slowly rotate the field rheostat control clockwise from the maximum counterclockwise position until the test light comes on. Observe the voltmeter reading at the moment that the light comes on. This is the relay closing voltage. If the relay closes immediately, even with the field rheostat close to the maximum counterclockwise position, push the red button between the two meters, and repeat the test. If the closing voltage is not to specification, replace the relay.

BATTERY TESTS AND CONCLUSIONS

Tests are made on a battery to determine the state of charge and also the condition. The ultimate result of these tests is to show that the battery is good, needs recharging, or must be replaced.

If a battery has failed, is low in charge, or requires water frequently, good service demands that the reason for this condition be found. It may be necessary to follow trouble shooting procedures to locate the cause of the trouble (Section 1 in this part).

Hydrogen and oxygen gases are produced during normal battery operation. This gas mixture can explode if flames or sparks are brought near the vent openings of the battery. The sulphuric acid in the battery electrolyte can cause a serious burn if spilled on the skin or spattered in the eyes. It should be flushed away with large quantities of clear water.

Before attempting to test a battery, it is important that it be given a thorough visual examination to determine if it has been damaged. The presence of moisture on the outside of the case and/or low electrolyte level in one or more of the cells are indications of possible battery damage.

The Rotunda batteries incorporate a single one-piece cover which completely seals the top of the battery and the individual cell connectors. This cover must not be pierced with test probes to perform individual cell tests. The Rotunda Cell Analyzer (S-RECA-200) measures the individual cell voltages by inserting probes into the cell openings. Follow the instructions that come with the unit.

A battery can also be tested by determining its ability to deliver current. This may be determined by conducting a Battery Capacity Test. Fig. 13 shows the battery capacity test in outline form.

BATTERY CAPACITY TEST

A high rate discharge tester (Battery-Starter Tester) in conjunction with a voltmeter is used for this test.

1. Turn the control knob on the Battery-Starter Tester to the OFF position.
2. Turn the voltmeter selector switch to the 20-volt position.
3. Connect both positive test leads to the positive battery post and both negative test leads to the negative battery post. **The voltmeter clips must contact the battery posts and not the high rate discharge tester clips. Unless this is done the actual battery terminal voltage will not be indicated.**
4. Turn the load control knob in a clockwise direction until the ammeter reads three times the ampere hour rating of the battery. (A 45 ampere-hour battery should be tested at 135 amperes load).
5. With the ammeter reading the

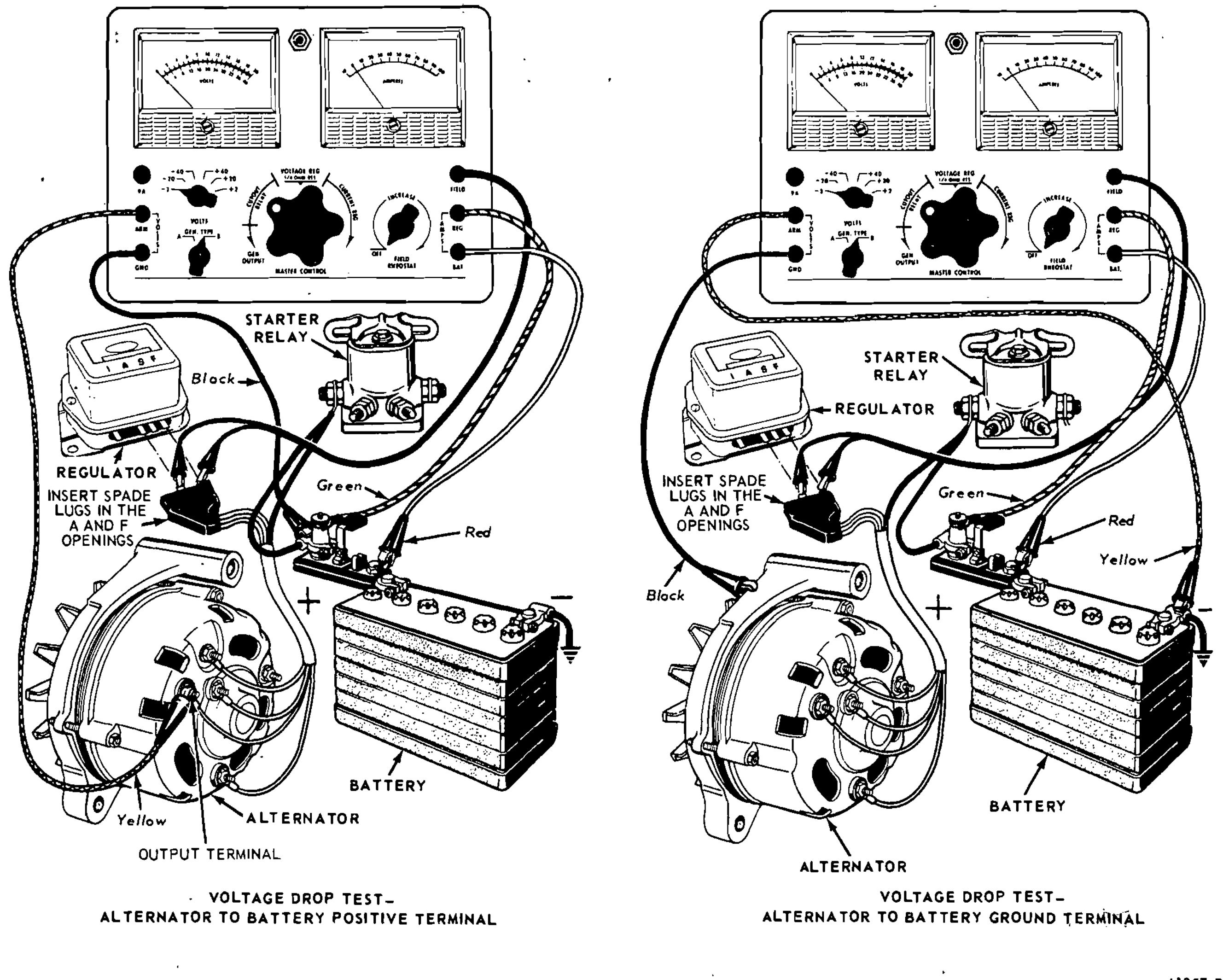


FIG. 7—Circuit Resistance Tests—Autolite

required load for 15 seconds, note the voltmeter reading. **Avoid leaving the high discharge load on the battery for periods longer than 15 seconds.**

6. If the voltmeter reading is 9.6 volts or more, the battery has good output capacity and will readily accept a charge, if required. Check the specific gravity. If the specific gravity reading is 1.230 or below, add water if necessary and charge the battery until it is fully charged.

The battery is full charged when the cells are all gassing freely and the specific gravity ceases to rise for three successive readings taken at hourly intervals. Additional battery testing will not be necessary after the battery has been properly charged.

7. If the voltage reading obtained during the capacity test is below 9.6 volts, check the specific gravity of each cell.

8. If the difference between any two cells is more than 50 points (0.050), the battery is not satisfactory for service and should be replaced.

9. If the difference between cells is less than 50 points (0.050) the battery should be charged according to the charging schedule in Table 2. In some cases the electrolyte level may be too low to obtain a specific gravity reading. In such cases water should be added until the electrolyte level just covers the ring in the filler well, then charge the battery at 35 amperes for the maximum charging time indicated in Fig. 14, for capacity of the battery being tested.

10. After the battery has been charged, repeat the capacity test. If the capacity test battery voltage is still less than 9.6 volts, replace the battery. If the voltage is 9.6 volts or more, the battery is satisfactory for service.

11. If the battery is found to be discharged only, check for a loose fan belt, loose electrical connections, charging system performance, and make a battery drain test (in this section).

BATTERY DRAIN TEST

This test will determine if there is any external load that would cause unwanted battery discharge.

Disconnect the battery ground ca-

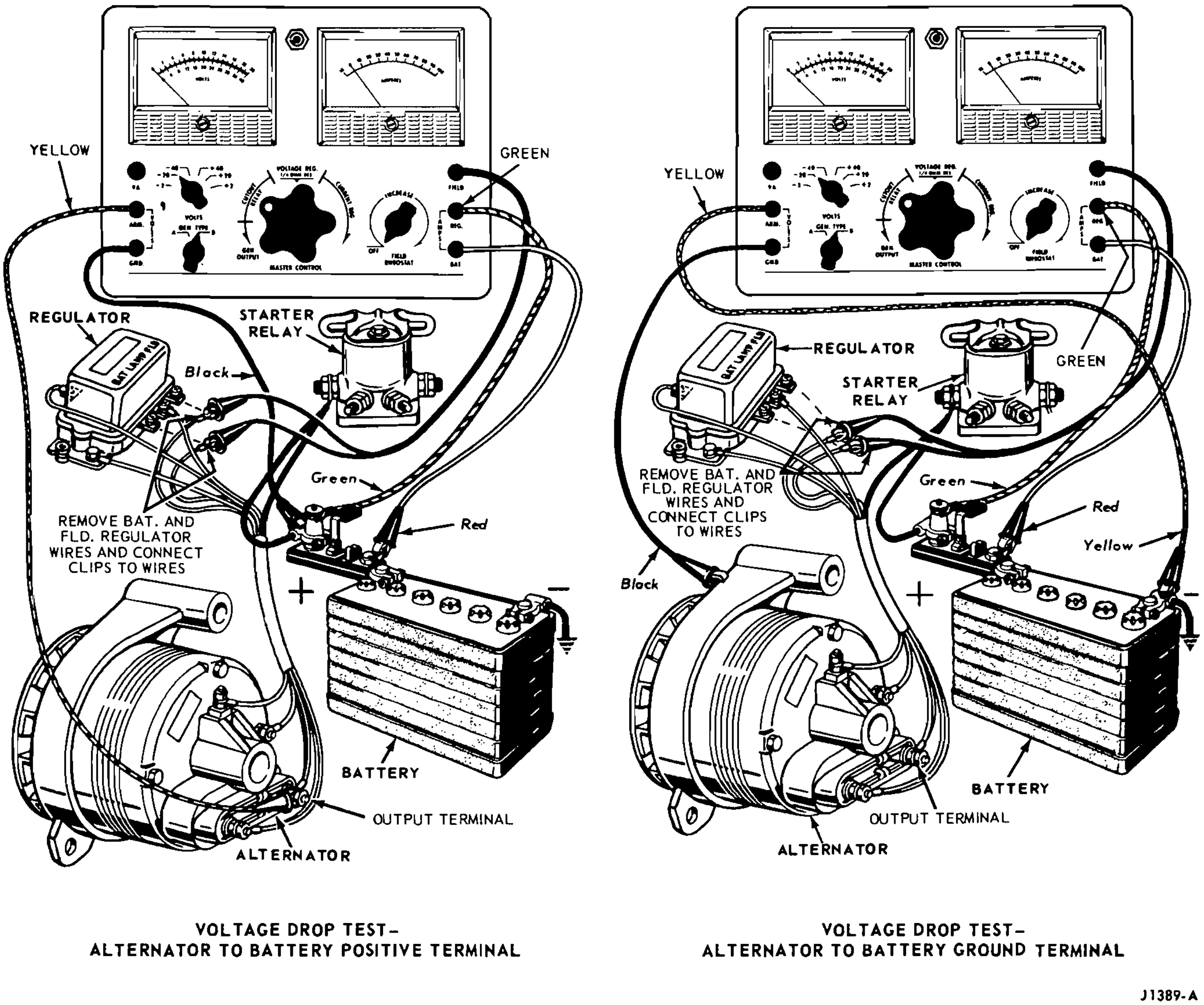


FIG. 8—Circuit Resistance Tests—Leece Neville 53-Ampere

ble and connect the positive lead of a voltmeter to the cable. Connect the negative lead of the voltmeter to the battery negative post.

With all circuits off, the meter should read zero. Any battery external load will cause the voltmeter to read full battery voltage.

If the car is equipped with an electric clock, momentarily connect the battery ground cable to the battery negative post to make certain that the clock is wound. When the clock runs down at the end of approximately 2 minutes the voltmeter will show full battery voltage.

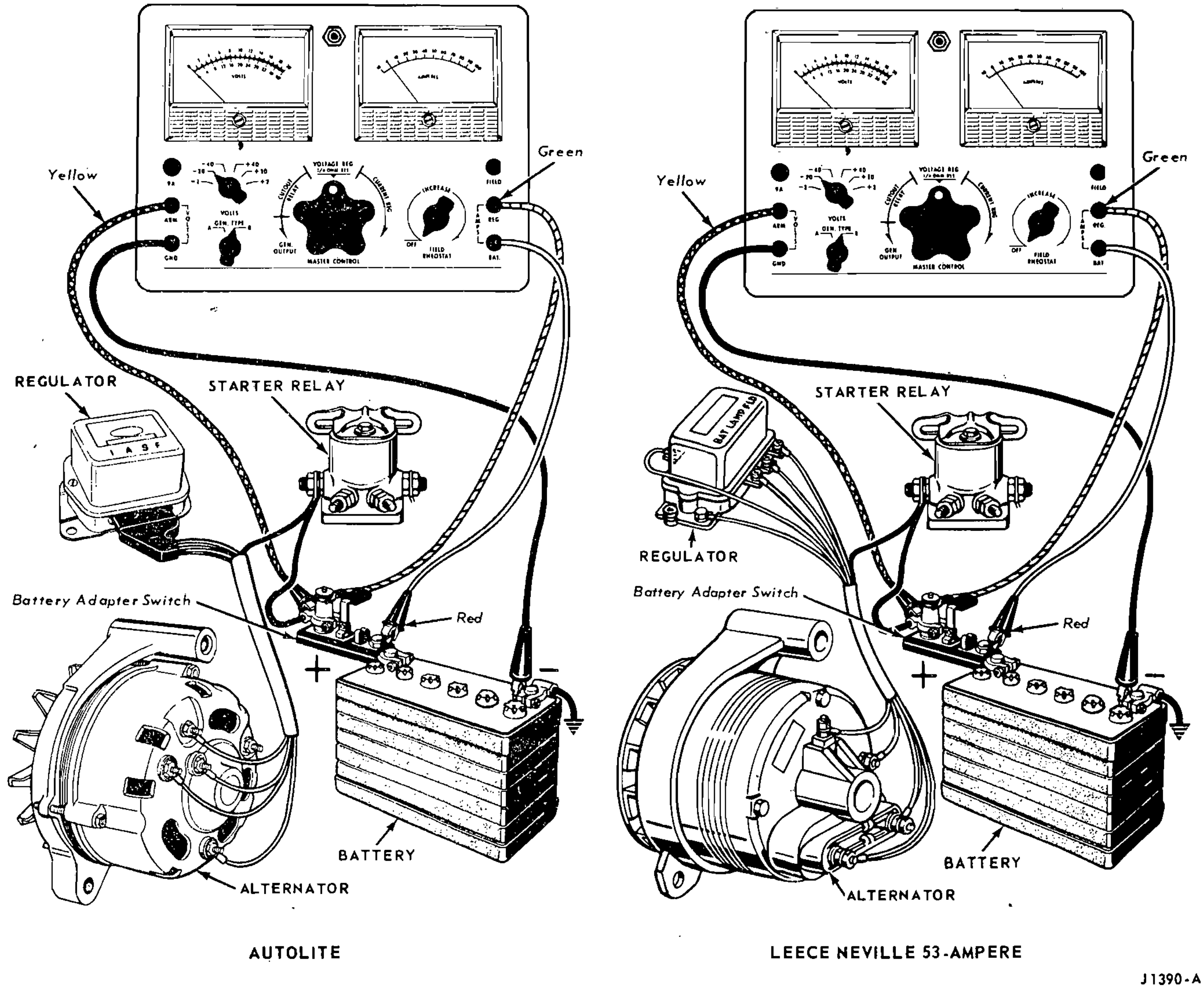


FIG. 9—Voltage Limiter Tests—Typical

Ambient Air Temperature °F	Voltage Limiter Setting (Volts)
50	14.1–15.1
75	13.9–14.9
100	13.7–14.7
125	13.6–14.6

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FIG. 10—Voltage Limiter Setting Versus Ambient Air Temperature (Mechanical or Transistor Regulator)

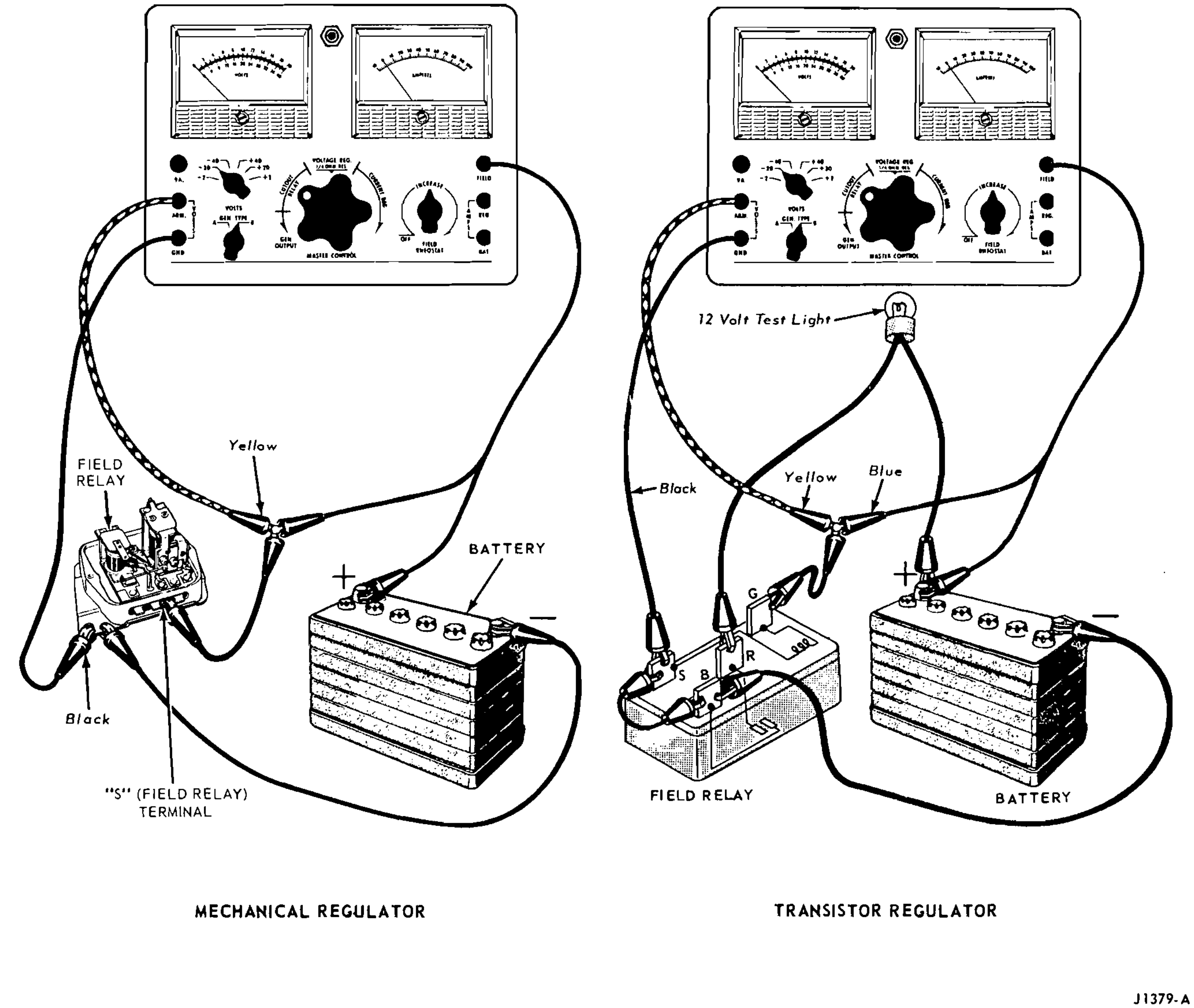

FIG. 11—Field Relay Test—Autolite Regulators

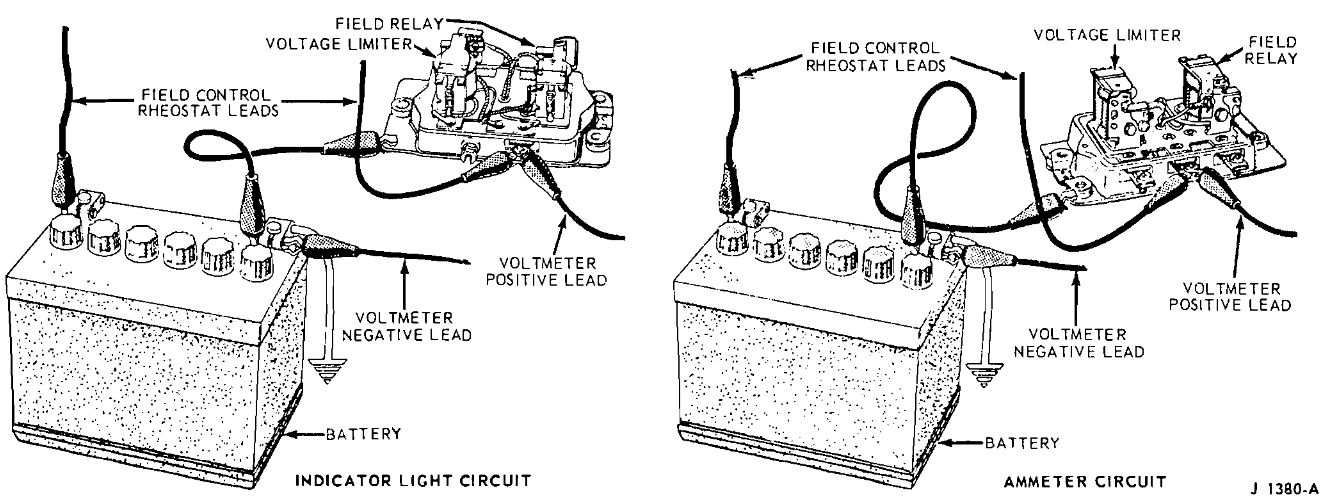

FIG. 12—Field Relay Test—Leece Neville Regulators

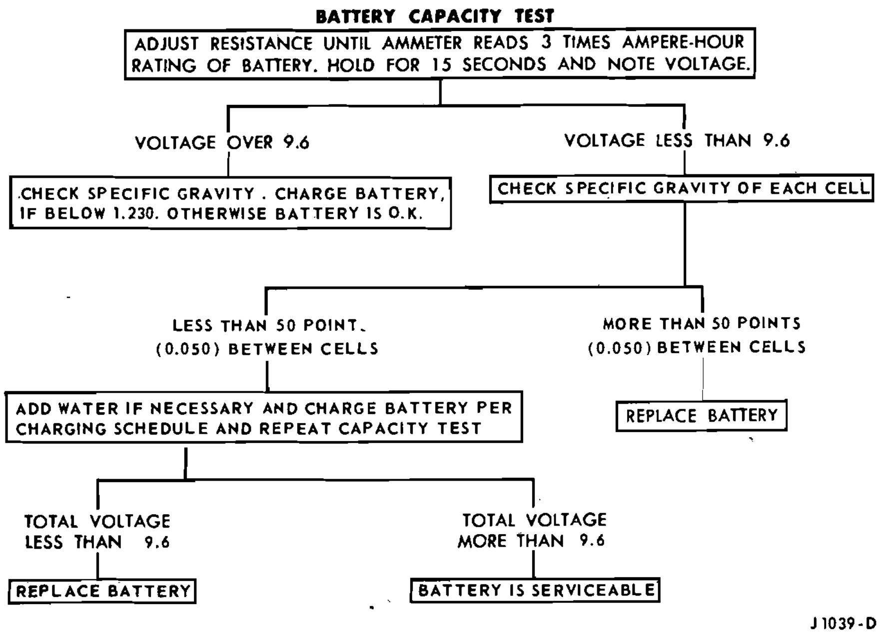

FIG. 13—Battery Capacity Test Outline

Specific Gravity Reading	Charge Rate Amperes	Battery Capacity – Ampere Hours				
		45	55	70	80	85
1.125–1.150 ①	35	65 min.	80 min.	100 min.	115 min.	125 min.
1.150–1.175	35	50 min.	65 min.	80 min.	95 min.	105 min.
1.175–1.200	35	40 min.	50 min.	60 min.	70 min.	75 min.
1.200–1.225	35	30 min.	35 min.	45 min.	50 min.	55 min.
Above 1.225	5	②	②	②	②	②

① If the specific gravity is below 1.125, use the indicated high rate of charge for the 1.125 specific gravity, then charge at 5 amperes until the specific gravity reaches 1.250 at 80° F.

Charge at 5 ampere rate only until the specific gravity reaches 1.250 at 80° F.

② **At no time during the charging operation should the electrolyte temperature exceed 130° F.**

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FIG. 14—Allowable Battery High Rate Charge Time Schedule

SLOW CRANKING AND HEADLIGHTS DIM AT IDLE	1. Battery low in charge. 2. Defective battery. 3. Corroded battery cables. 4. Loose alternator drive belt. 5. Continuous drain on battery. 6. Alternator regulator voltage limiter out of adjustment. 7. Defective alternator. 8. Customer battery usage.
CHARGE INDICATOR GAUGE SHOWS NO READING OR GAUGE OPERATES IN REVERSE	1. Incorrect or no connections to gauge. 2. Defective gauge.
CHARGE INDICATOR LIGHT STAYS ON OR CHARGE INDICATOR GAUGE INDICATES CONSTANT DISCHARGE	1. Loose or broken drive belt. 2. Loose connections, or broken wires. 3. Regulator voltage limiter or field relay out of adjustment or defective regulator. 4. Grounded wiring from alternator to regulator. 5. Open 15-ohm resistor across charge indicator light. 6. Defective alternator.
LIGHTS AND FUSES FAIL PREMATURELY, SHORT BATTERY LIFE, BATTERY USES EXCESSIVE WATER	1. Loose or corroded connections. 2. High voltage limiter setting.
ALTERNATOR NOISY	1. Loose or bumpy belt. 2. Noisy alternator bearing. 3. Shorted alternator diode. 4. Alternator stator core cocked in housings.
CHARGE INDICATOR LIGHT FLICKERS OR CHARGE INDICATOR GAUGE FLUCTUATES	1. Loose or damaged connections or wiring. 2. Dirty or oxidized alternator regulator contacts (mechanical regulator). 3. Defective field relay (transistor regulator). 4. Worn alternator field brushes or slip rings or improper brush spring tension. 5. Open circuit alternator negative diode.
CHARGE INDICATOR LIGHT DOES NOT LIGHT WHEN IGNITION SWITCH IS TURNED ON	1. Burned out charge indicator bulb. 2. Defective wiring. 3. Defective alternator regulator.

FIG. 15—Charging System Trouble Diagnosis Guide

PART 13-2— *Autolite Alternators*

1 DESCRIPTION AND OPERATION

The alternator charging system is a negative (—) ground system, and consists of an alternator, a regulator, a charge indicator, a storage battery and associated wiring. Refer to Wiring Diagram Manual Form 7795P-67 for locations of wiring harnesses. Schematics are shown in Group 19 of this manual.

ALTERNATOR

The alternator is belt driven from the engine. The mechanical construction of the alternator differs from a generator in that the field rotates, and the generating windings are stationary. Energy is supplied from the alternator-regulator system to the rotating field through two brushes to two slip rings. The slip rings are mounted on the rotor shaft (Fig. 4), and are connected to the field coil.

The alternator produces power in the form of alternating current. The alternating current is rectified to direct current by six diodes (Fig. 7) for use in charging the battery and supplying power to the electrical system.

2 COMMON ADJUSTMENTS AND REPAIRS

BELT ADJUSTMENT— ALTERNATOR

1. Loosen the alternator mounting bolt to a snug position and the adjusting arm bolts.
2. **Apply pressure on the alternator front housing only** and tighten the adjusting arm to alternator bolt.
3. Check the belt tension using tool T63L-8620-A. Adjust the belt for specified tension.
4. Tighten all mounting bolts.

3 REMOVAL AND INSTALLATION

REMOVAL — EXCEPT COUGAR

1. Disconnect the battery ground cable, then raise the car on a hoist.
2. Loosen the alternator mounting bolts and remove the adjustment arm to alternator bolt.
3. Disengage the alternator belt. Remove the alternator mounting bolt, disconnect the alternator wiring harness and remove the alternator.

INSTALLATION—EXCEPT COUGAR

1. Attach the alternator wiring harness (Fig. 1 or 2). Position the alternator to the engine, and install the alternator mounting bolt finger-tight.
2. Install the adjustment arm to alternator bolt.
3. Adjust the belt tension using tool T63L-8620-A. **Apply pressure on the alternator front housing only, when tightening the belt.** Tighten the adjusting arm bolts and the mounting bolt.
4. Lower the car and connect the battery ground cable.

REMOVAL — COUGAR

1. Disconnect the battery ground cable.
2. Remove the alternator adjusting arm bolt.
3. Remove the ground wire bolt from the cylinder block.
4. Open the clip on right fender apron retaining the alternator harness.
5. Remove the alternator mounting bolt and spacer. Position the belt off the pulley and lay the alternator on top of the fender.
6. Disconnect the leads and clip and remove the alternator.

INSTALLATION — COUGAR

1. Lay the alternator on top of the fender and connect the leads (Fig. 3).
2. Position the alternator to the block and install the mounting bolt and spacer finger tight. Position the belt on the pulley.
3. Position the ground wire to the block and install the ground wire bolt.
4. Install the adjusting arm bolt finger tight, adjust the belt tension and tighten the bolts.
5. Install the wire harness in the fender clip, connect the battery, and check the alternator operation.

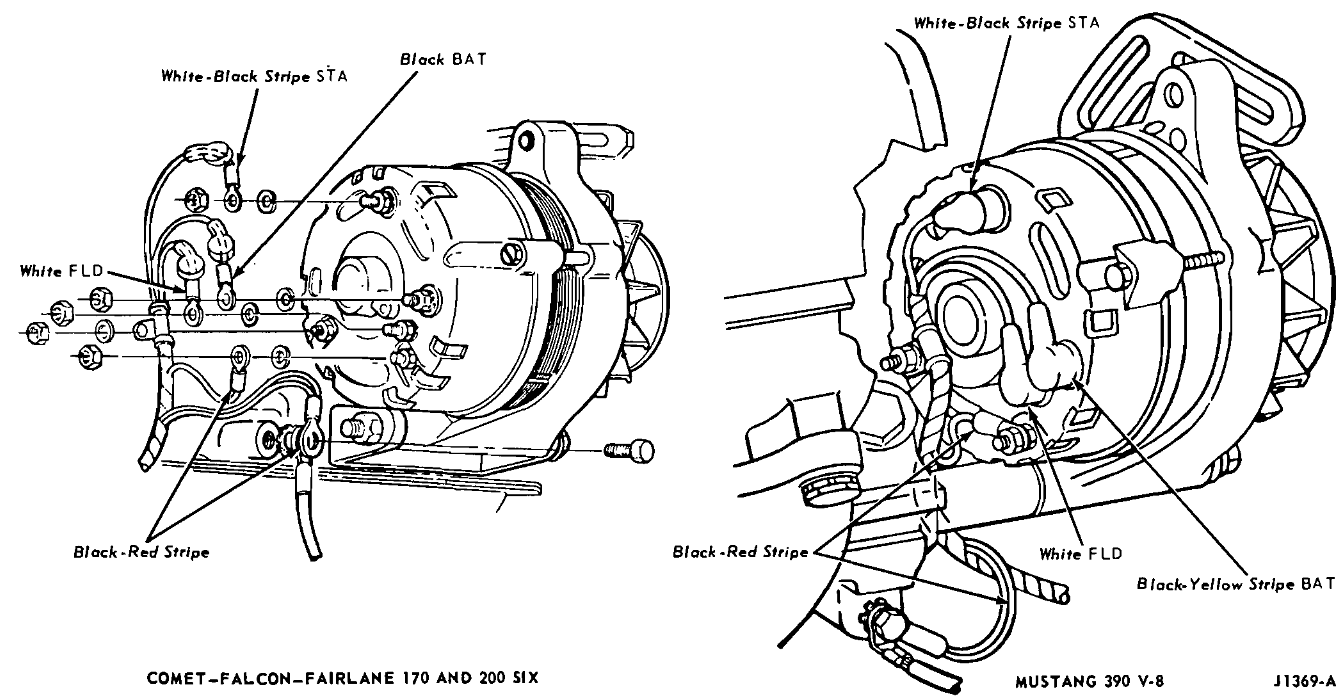

FIG. 1—Mercury Intermediate, Falcon, Fairlane 170 and 200 Six and Mustang 390 V-8 Alternator Connections

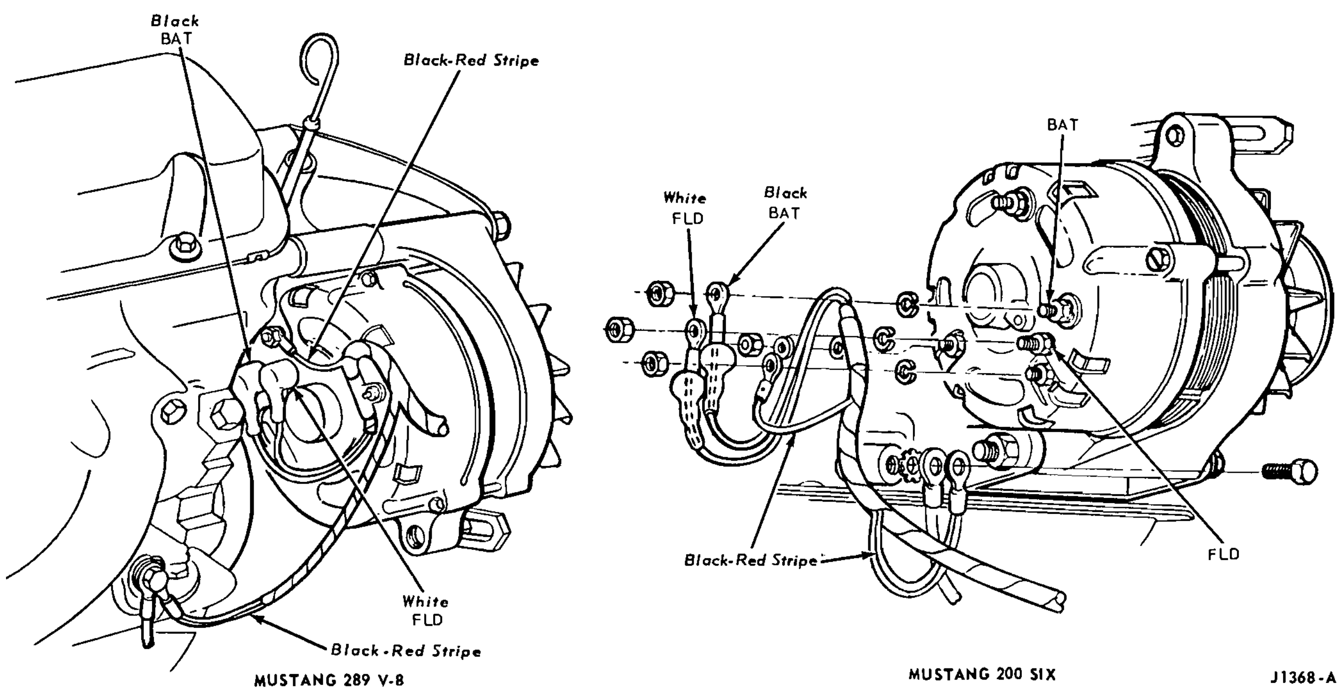

FIG. 2—Mustang Alternator Connections

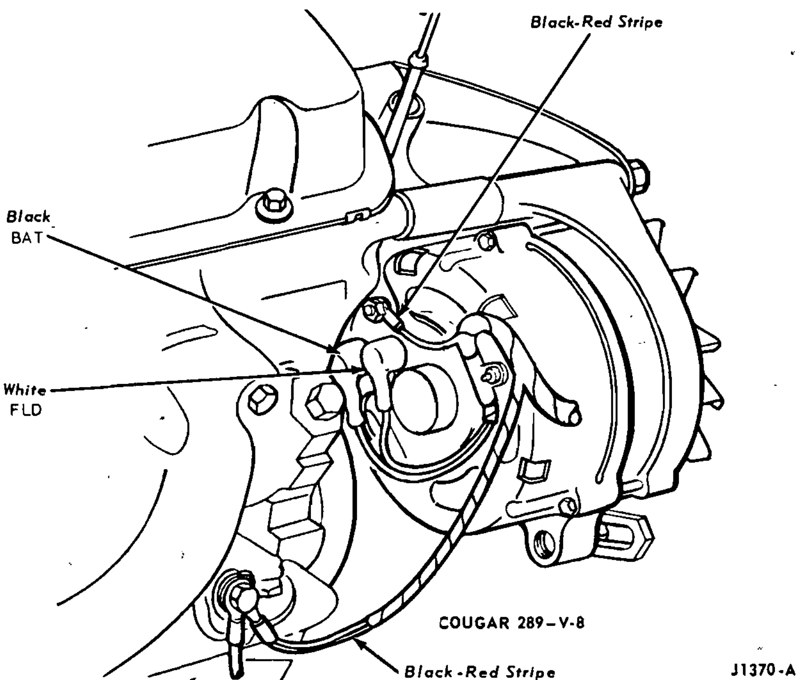

FIG. 3—Cougar Alternator Connections

4 MAJOR REPAIR OPERATIONS

DISASSEMBLY

Fig. 4 shows a disassembled view of the Ford alternator.

1. Mark both end housings and the stator with a scribe mark for assembly.

2. Remove the three housing through bolts.

3. Separate the front end housing and rotor from the stator and rear end housing.

4. Remove all the nuts and washers from the rear end housing and remove the rear end housing from the stator and diode plate assembly.

5. Remove the brush holder mounting screws and remove the holder,

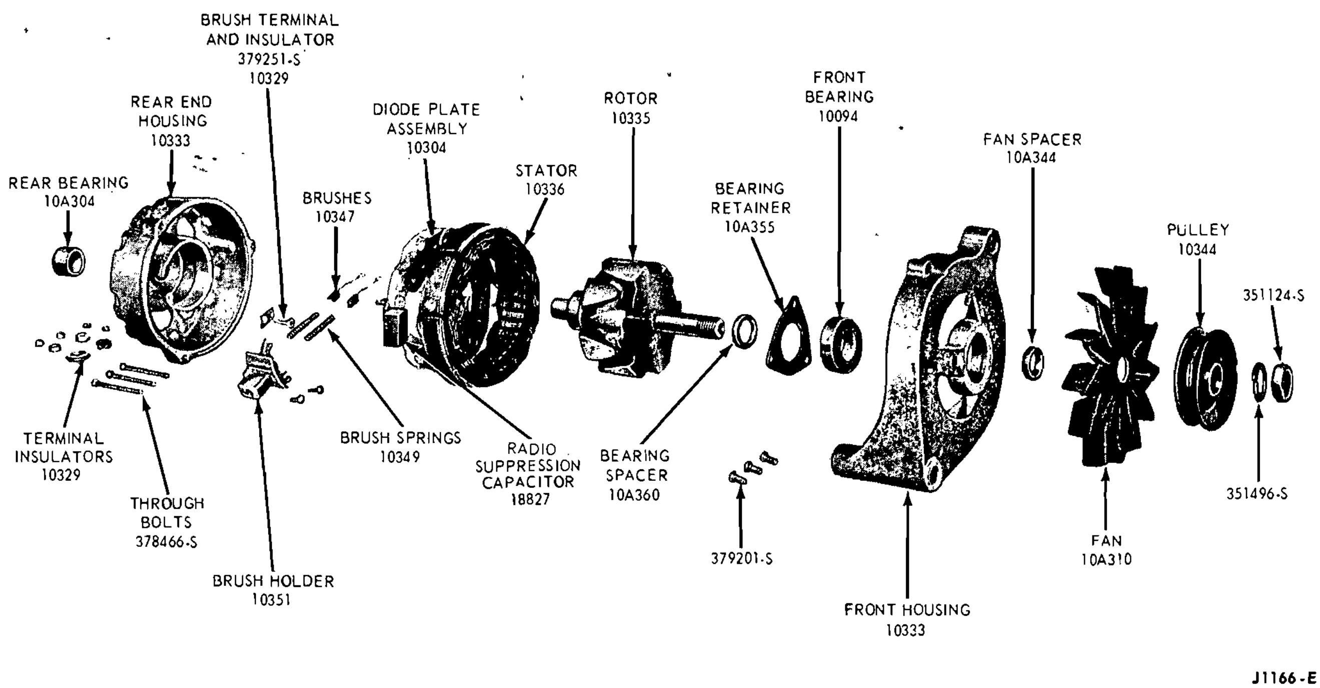

FIG. 4—Disassembled Alternator

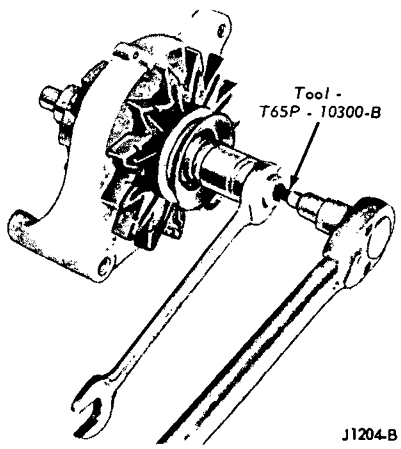

FIG. 5—**Pulley Removal**

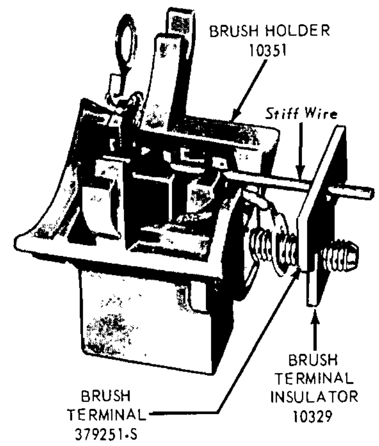

FIG. 6—**Brush Holder Assembly**

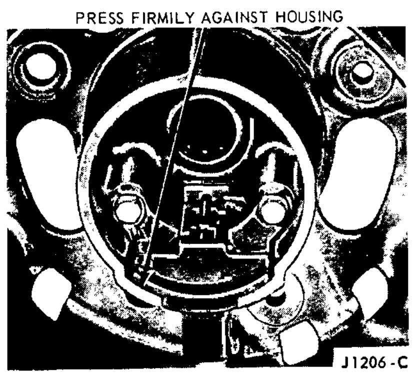

FIG. 7—**Brush Lead Positions**

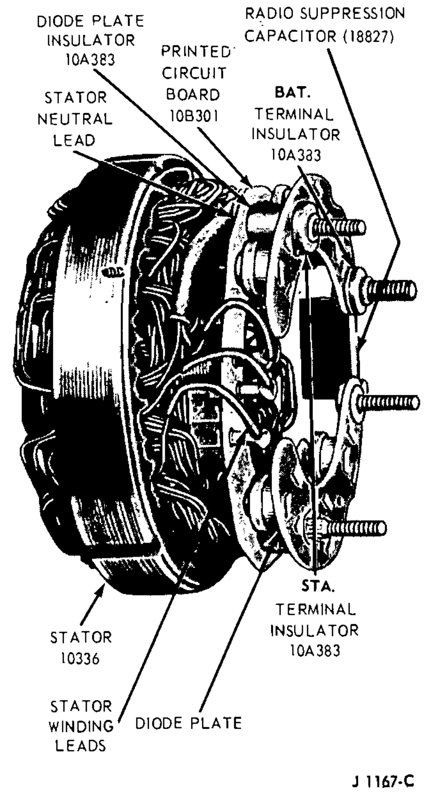

FIG. 8—**Stator Lead Connections**

brushes, brush springs, insulator and terminal.

6. If replacement is necessary, press the bearing from the rear end housing, supporting the housing on the inner boss.

7. If the diode plate assembly is being replaced, unsolder the stator leads from the printed-circuit board terminals, and separate the stator from the diode plate assembly. Use a 100-watt soldering iron.

8. If the printed-circuit board is being replaced, cut the printed-circuit board into six separate pieces and unsolder each piece from the diode it is attached to. Remove and discard the roll pins from the diode plates.

9. Remove the drive pulley nut, lockwasher, pulley, fan, fan spacer, rotor and rotor stop (Fig. 5).

10. Remove the three screws that hold the front end bearing retainer, and remove the retainer. Support the housing close to the bearing boss, and press out the old bearing from the housing, only if the bearing is defective or has lost its lubricant.

11. Perform a diode test and a field open or short circuit test (Part 13-1).

CLEANING AND INSPECTION

1. The rotor, stator and bearings must not be cleaned with solvent. Wipe these parts off with a clean cloth.

2. Rotate the front bearing on the drive end of the rotor drive shaft. Check for any scraping noise, looseness or roughness that will indicate that the bearing is excessively worn. Look for excessive lubricant leakage. If any of these conditions exist, replace the bearing.

3. Inspect the rotor shaft at the rear bearing surface for roughness or severe chatter marks. Replace the rotor assembly if the shaft is not smooth.

4. Place the rear end bearing on the slip-ring end of the shaft and rotate the bearing on the shaft. Make the same check for noise, looseness or roughness as was made for the front bearing. Inspect the rollers and cage for damage. Replace the bearing if these conditions exist, or if the lubricant is lost or contaminated.

5. Check the pulley and fan for excessive looseness on the rotor shaft. Replace any pulley or fan that is loose or bent out of shape. Check the rotor shaft for stripped or damaged threads. Inspect the hex hole in the end of the shaft for damage.

6. Check both the front and rear housings for cracks. Check the front housings for stripped threads in the mounting ear. Replace defective housings.

7. Check all wire leads on both the stator and rotor assemblies for loose soldered connections, and for burned insulation. Resolder poor connections. Replace parts that show burned insulation.

8. Check the slip rings for nicks and surface roughness. Nicks and scratches may be removed by turning down the slip rings. Do not go beyond the minimum diameter limit of 1.22 inches. If the slip rings are badly damaged, the entire rotor will have to be replaced, as it is serviced as a complete assembly.

9. Replace any parts that are burned or cracked. Replace brushes and brush springs that are not to specification. The diode plate assembly is serviced as an assembly. However the printed circuit board is serviced separately.

ASSEMBLY

1. Press the front end bearing in the bearing boss (put pressure on the outer bearing only), and install the bearing retainer.

2. If the stop-ring on the rotor drive shaft was damaged, install a new stop-ring. Push the new ring on the shaft and into the groove. **Do not open the ring with snap ring pliers as permanent damage will result.**

3. Position the rotor stop on the drive shaft with the recessed side against the stop-ring.

4. Position the front end housing, fan spacer, fan, pulley and lock washer on the drive shaft and install the retaining nut (Fig. 4), to specified torque.

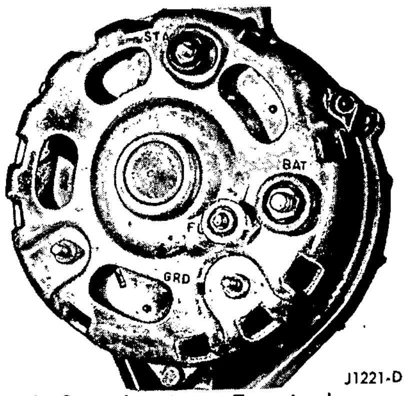

FIG. 9— **Alternator Terminal Locations**

5. If the rear end housing bearing was removed, support the housing on the inner boss and press in a new bearing flush with the outer end surface.

6. Place the brush springs, brushes, brush terminal and terminal insulator in the brush holder and hold the brushes in position by inserting a piece of stiff wire in the brush holder as shown in Fig. 6.

7. Position the brush holder assembly in the rear end housing and install the mounting screws. Position the brush leads in the brush holder as shown in Fig. 7.

8. If a new diode plate or printed circuit board is being installed, position the diode plate so that the diode leads go through the three holes in the printed-circuit board. Install the terminal bolt and insulator. Install new roll pins to maintain the 1/2-inch insulator spacing between the printed-circuit board and the diode plate. Install a solder ring, then a small tinned washer on each diode lead and solder the diode leads to the printed-circuit board. Use a 100-watt iron. Avoid excess heat on the printed-circuit board so as not to loosen the printed-circuit wiring from the board.

9. Wrap the three stator winding leads around the printed-circuit board terminals and solder them. Use a 100-watt soldering iron and rosin-core solder. Position the stator neutral lead eyelet on the stator terminal insulators (Fig. 8). Position the diode assembly (Fig. 8).

10. Install the STA and BAT terminal insulators (Fig. 8). Position the stator and diode plate assembly in the rear end housing. Position the STA (black), BAT (red) and FLD (white) insulators, on the terminal bolts, and install five retaining nuts (Fig. 9).

11. Wipe the rear end bearing surface of the rotor shaft with a clean lint-free rag.

12. Position the rear end housing and stator assembly over the rotor and align the scribe marks made during disassembly. Seat the machined portion of the stator core into the step in both end housings. Install the housing through bolts. Remove the brush retracting rod, and put a daub of waterproof cement over the hole to seal it.

PART 13-3— *Autolite Alternator Regulators*

1 DESCRIPTION AND OPERATION

MECHANICAL VOLTAGE REGULATOR

The alternator regulator is composed of two control units, a field relay and a voltage limiter, mounted as an assembly (Fig. 1). Because the reverse current through the rectifier is is small, a reverse current cutout relay is not needed. The alternator is self current limiting, thus a current limiter is not needed. Refer to Wiring Diagram Manual Form 7795P-67 for locations of wiring harnesses. Schematics are shown in Group 19 of this manual.

FIELD RELAY

The field relay serves to connect charging system voltage to the field circuit when the engine is running.

Charge Indicator Circuit—Light

When the ignition switch is closed, battery current flows through the charge indicator light and 15-ohm parallel resistor, and through the regulator voltage limiter contacts to the field coil. This small current is enough to allow the alternator to start generating, and is necessary, as residual magnetism in the alternator is usually too small to start voltage build-up. The charge indicator light is shunted with a 15-ohm resistor to supply adequate starting field current.

When the alternator builds up enough voltage to close the field relay contacts, full voltage is applied to the field, and the charge indicator light goes out.

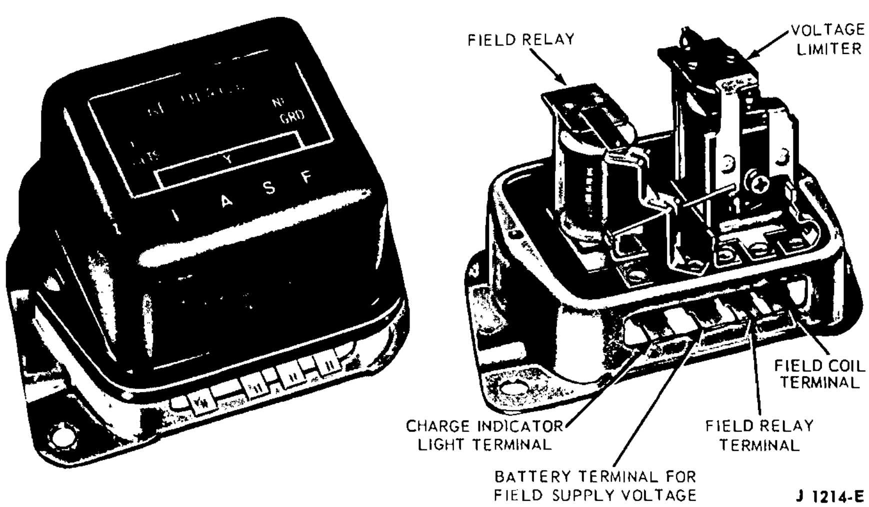

FIG. 1—Alternator Regulator

Charge Indicator Circuit. —Ammeter

When the ignition switch is closed, the field relay is energized. Closing of the relay contacts connects the battery and alternator output to the field through the voltage limiter contacts.

VOLTAGE LIMITER

The temperature compensated voltage limiter is a double contact unit. Limiting is accomplished by controlling the amount of current supplied to the rotating field.

When the upper contacts are closed, full system voltage is applied to the field and maximum field current will flow. When the limiter armature floats between the contacts, field current is reduced by flowing through the field resistor. When the limiter lower contacts are closed, zero current flows to the field. At low engine speed and with a load applied, the armature vibrates on the upper contact. At high engine speed and light or no load the armature vibrates on the lower contact.

TRANSISTORIZED VOLTAGE REGULATOR

The transistorized voltage regulator (Fig. 2), controls the alternator voltage output in a similar manner to an electro-mechanical voltage regulator, by regulating the alternator field current. The regulation is accomplished electronically with the use of transistors and diodes rather than by a vibrating armature relay. The voltage sensing element is a zener diode which has the characteristic of suddenly changing its resistance when a specified voltage is reached. The

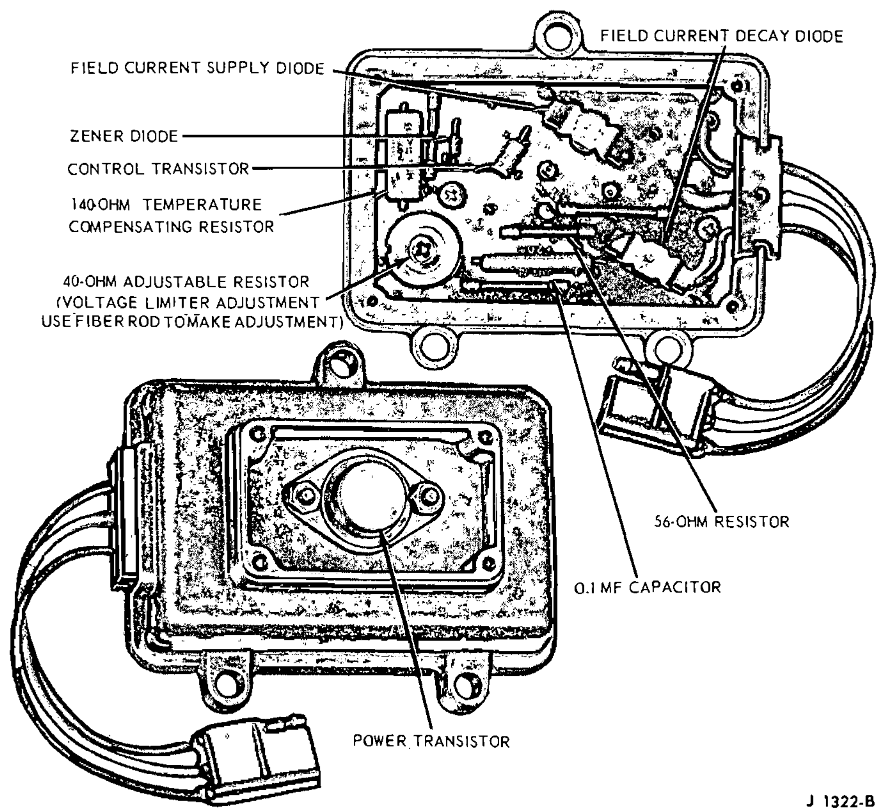

FIG. 2—Transistorized Voltage Regulator

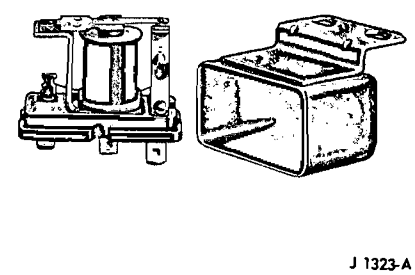

FIG. 3—Field Relay

The field current decay diode performs the same function as the resistors in a mechanical regulator, providing a path to ground for the energy from the field when the field current is interrupted.

The 140-ohm resistor is made of a special material that changes its resistance with temperature in such a manner that during cold weather the battery charging voltage is increased. This resistor performs the same function as the bi-metal hinge on the voltage limiter armature of a mechanical regulator.

field relay (Fig. 3) is still used, but it is mounted separately from the voltage regulator.

Figs. 4 and 5 show schematics of the transistorized voltage regulator system. When the engine is started, battery current is supplied to the field through the field relay, field current supply diode, and the power transistor.

As the alternator begins to supply current, the battery voltage will increase. When the battery voltage reaches approximately 14.5 volts, the zener diode (Figs. 4 and 5), due to its characteristics, suddenly reduces its resistance and lowers the voltage at point B on the control transistor. The control transistor then acting as a switch applies battery voltage to point B on the power transistor. The power transistor also acting as a switch then opens, cutting off battery current to the field. The battery voltage drops slightly, the zener diode increases its resitance, opening the control transistor, which in turn closes the power transistor and battery current again flows to the alternator field.

The sequence of events repeats itself at an approximate rate of 2000 times per second, which is faster than the rate that a mechanical regulator interrupts the field current.

The field current supply diode is used to protect the power transistor.

The alternator output voltage is adjusted by varying the 40-ohm adjustable resistor (Fig. 2). Varying the adjustable resistor performs the same function as adjusting the voltage limiter armature spring tension on a mechanical regulator.

The 0.1 microfarad capacitor in series with the 56-ohm resistor causes the control transistor and the power transistor to switch on and off faster providing better control of the field current.

The remaining resistors in the unit provide proper operating voltages for the zener diode and the two transistors.

2 REGULATOR ADJUSTMENTS

TEMPERATURE COMPENSATION

The alternator regulator has been designed to exercise automatic control over the charging system, and also to compensate for seasonal temperature changes. In cold weather a higher voltage output is required to handle the load. In warm weather, the voltage must be reduced to avoid over charging the battery. The temperature compensation is built into the regulator unit by making the armature hinge of bi-metal (mechanical regulator). The temperature sensitivity of the bi-metal causes the regulator voltage setting to change according to temperature.

Therefore, it is necessary to establish a normal or stabilized regulator operating temperature to coincide with the specified voltage setting of volts. The standard ambient air temperature established for this setting is 75 ° Fahrenheit. The regulator temperature for this or any setting, is defined as the temperature of the regulator after 1/2 hour of operation in the car or, after the regulator has been heated until it becomes stabilized.

For correct voltage regulation ad-

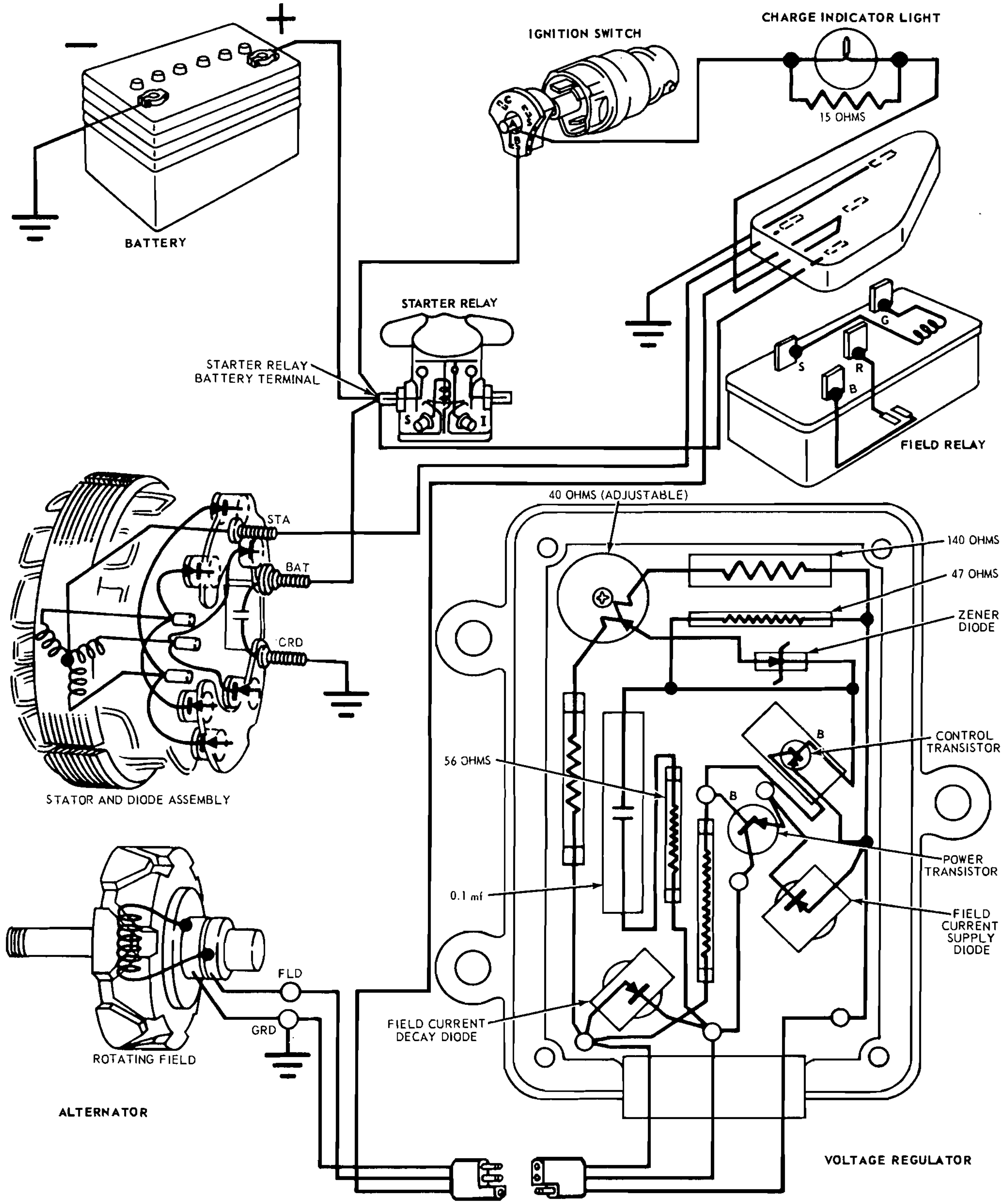

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FIG. 4—Alternator System With Transistor Voltage Regulator and Charge Indicator Light

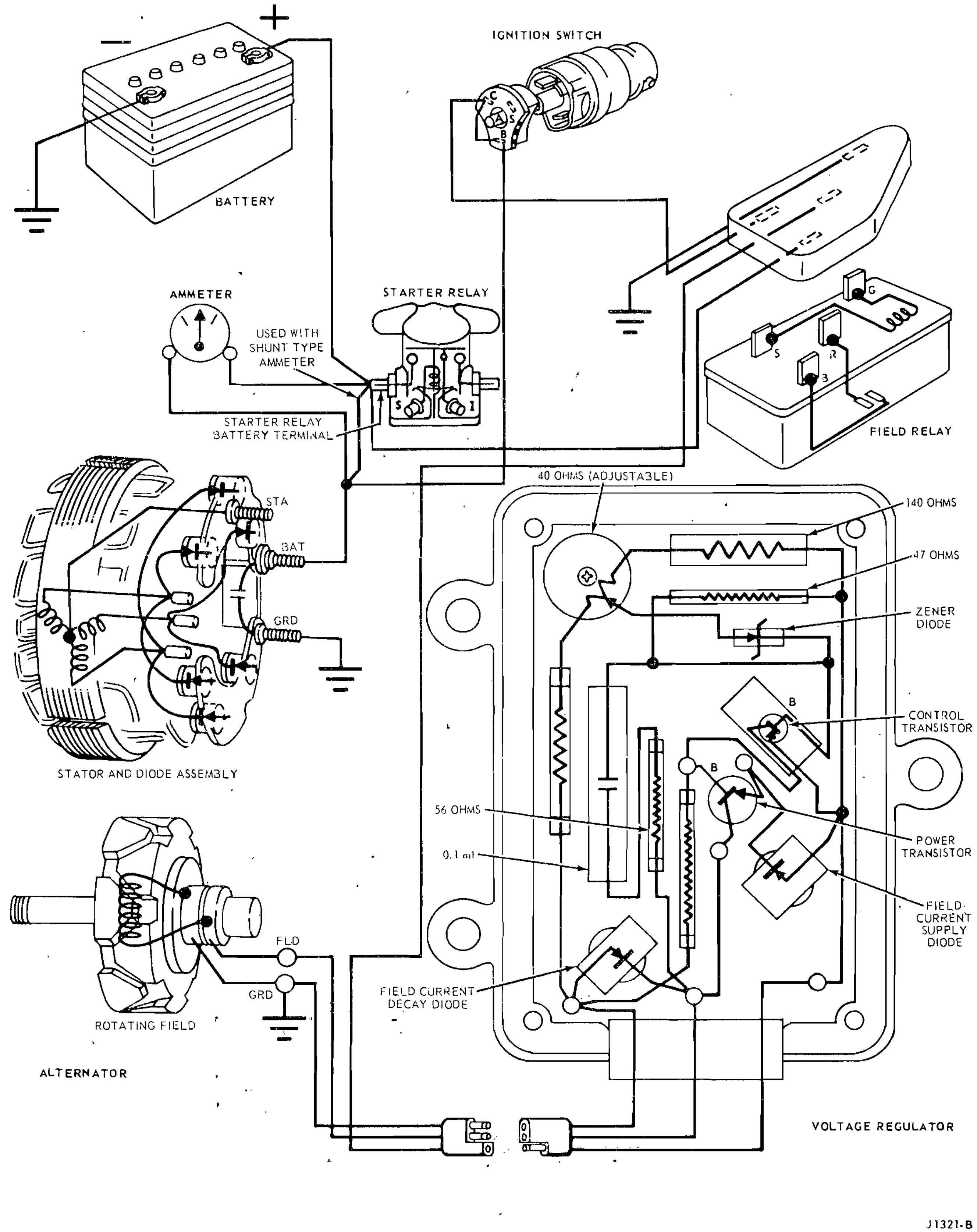


FIG. 5—Alternator System With Transistor Voltage Regulator and Ammeter

justment, first be sure that the regulator has reached Normal operating temperature as defined above; then make the voltage adjustment setting to coincide with the prevailing, ambient air temperature. The specifications section shows the proper voltage limits for various ambient air temperatures.

ON THE CAR

On the car, ambient air temperature will be the temperature of the engine compartment air. To measure the air temperature, first clip the voltage regulation setting thermometer onto the regulator cover.

Run the engine to stabilize the regulator. The engine fan will cause the air in the engine compartment to circulate past the regulator until the regulator has stabilized at the ambient air temperature. After the regulator and thermometer have stabilized, the thermometer will show the voltage setting at which the regulator should be operating.

ON THE TEST BENCH

When the regulator is mounted on a regulator test bench, the ambient air temperature will be the room temperature. Clip the voltage regulator setting thermometer onto the regulator cover. Mount a small fan on the regulator test bench about 12 to 15 inches from the regulator. Operate the fan and regulator to stabilize the regulator. The fan will provide sufficient air flow to ensure stabilization of the regulator at the temperature indicated by the thermometer. After stabilization, the thermometer will show the voltage setting at which the regulator should be operating.

MECHANICAL REGULATOR ADJUSTMENTS

Remove the regulator from the vehicle for all regulator adjustments.

FIELD RELAY ADJUSTMENTS

Air Gap Adjustment

Place a 0.010 to 0.018-inch feeler gauge on top of the coil core closest to the contact points. Hold the armature down on the gauge. Do not push down on the contact spring arm. Bend the contact post arm (Fig. 6) until the bottom contact just touches the upper contact.

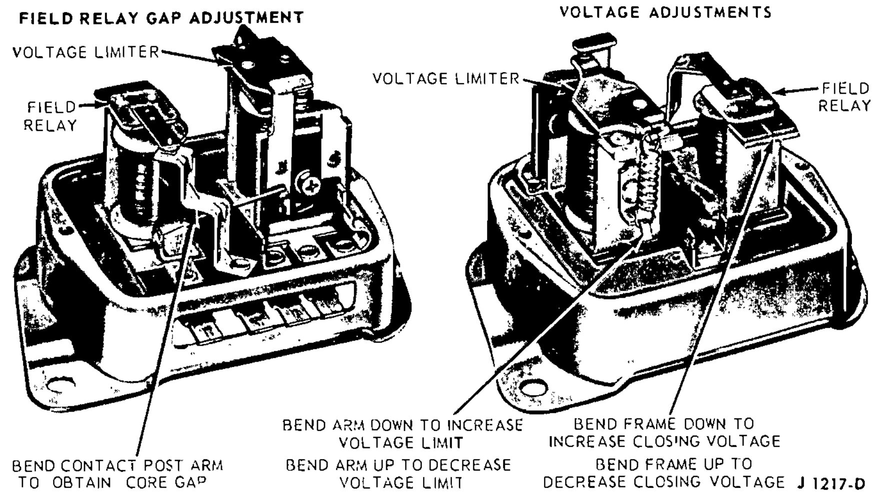


FIG. 6—Regulator Adjustments

Closing Voltage Adjustment

The field relay closing voltage is adjusted by bending the relay frame (Fig. 6). To increase the closing voltage, bend the armature frame down. To decrease the closing voltage, bend the frame up. Follow the test procedures as outlined under Regulator Tests in Part 13-1 Section 2 Testing, when making this adjustment.

VOLTAGE LIMITER ADJUSTMENT

Place the regulator on an alternator-regulator test stand for this adjustment. Final adjustment of the regulator must be made with the regulator at normal operating temperature.

The voltage limiter is adjusted by bending the voltage limiter spring arm (Fig. 6). To increase the voltage setting, bend the adjusting arm downward. To decrease the voltage setting, bend the adjusting arm upward.

Before setting the voltage and before making a final voltage test, the alternator speed must be reduced to zero and the ignition switch opened momentarily to de-energize the regulator circuits, to cycle the regulator.

Erratic operation of the regulator, indicated by erratic movement of the voltmeter pointer during a voltage limiter test, may be caused by dirty or pitted regulator contacts. **Vehicle ammeter pointer waver at certain critical engine speeds and electrical loads, is normal and is not a cause for regulator replacement.**

Follow the test procedures as outlined under Regulator Tests in Part 13-1 Section 2 Testing, when making this adjustment.

TRANSISTORIZED REGULATOR ADJUSTMENTS

REGULATOR VOLTAGE LIMITER ADJUSTMENTS

The only adjustment on the transistorized alternator regulator is the voltage limiter adjustment.

Adjustment of the transistor voltage limiter must be made with the regulator at normal operating temperature. Remove the regulator mounting screws and remove the bottom cover from the regulator. The voltage setting may be moved up or down by adjusting the 40-ohm adjustable resistor (Fig. 2). Use a fiber rod as a screw driver for this adjustment.

3 REMOVAL AND INSTALLATION

1. Remove the battery ground cable.
2. Remove the regulator mounting screws.
3. Disconnect the regulator from the wiring harness.
4. Connect the new regulator to the wiring harness.
5. Mount the regulator to the regulator mounting plate. The radio suppression condenser mounts under one mounting screw. The ground lead mounts under the other mounting screw.
6. Connect the battery ground cable, and test the system for proper voltage regulation.

PART 13-4— 53-Ampere Leece Neville Alternator

1 DESCRIPTION AND OPERATION

The operation and general electrical description of the Leece Neville 53-ampere alternator is similar to that of the Autolite alternators, (Part 13-2). The field brushes are mounted in an insulated brush holder which is mounted in the brush end housing (Fig. 2).

The drive end bearing is a sealed ball bearing. The brush end bearing is a needle type bearing and is not sealed. The alternator mountings are shown in Fig. 1.

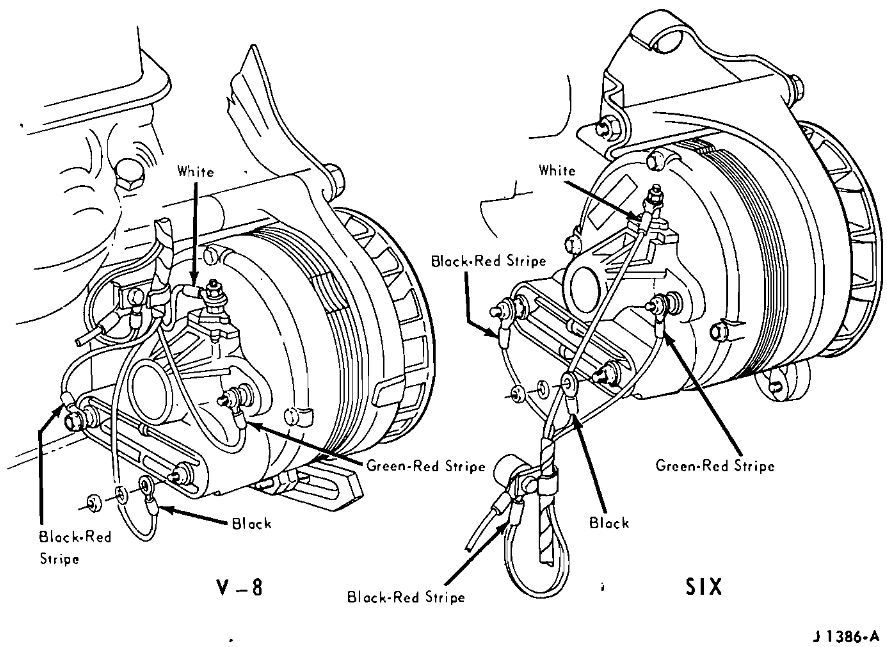


FIG. 1—Alternator Mounting—Typical

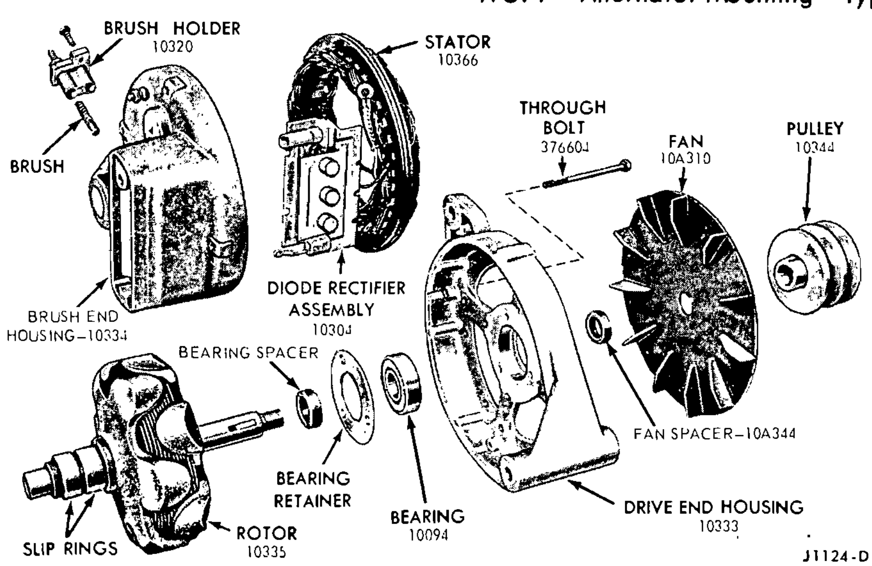


FIG. 2—Disassembled 53-Ampere Leece Neville Alternator

2 REMOVAL AND INSTALLATION

REMOVAL

1. Disconnect the battery ground cable.
2. Loosen the alternator mounting bolts and remove the adjustment arm to alternator bolt.
3. Disengage the alternator belt. Remove the alternator mounting bolt, disconnect the alternator wiringing and remove the alternator.

INSTALLATION

1. Attach the alternator wiring. Position the alternator to the engine, and install the alternator mounting bolt finger-tight (Fig. 1).
2. Install the adjustment arm to alternator bolt.
3. Adjust the belt tension using tool T63L-8620-A. Apply pressure on the alternator drive end housing only. Tighten the adjusting arm bolts and the mounting bolt.
4. Connect the battery ground cable.

3 MAJOR REPAIR OPERATIONS

DISASSEMBLY

1. Remove the brush holder and the brushes (Fig. 2). Scribe the end housings for reference in assembly.
2. Remove the alternator housing through bolts, and separate the drive end housing and rotor from the stator and brush end housing.
3. Press the rotor shaft out of the drive end housing only if the rotor or bearing are being replaced. Remove the bearing spacer.
4. Remove the bearing retainer, support the housing around the bearing pocket to prevent damage to the housing, and press the bearing from the drive end housing. Remove the bearing only if replacement is required.
5. Remove the BT, Neut., and ground terminal nuts and washers, and remove the brush end housing from the stator and diode rectifier assembly.
6. If the diode plates or stator are being replaced, carefully unsolder the three stator leads from the diode connector eyelets, and separate the leads from each other. Clean the solder from the eyelets.
7. Press the brush end housing bearing from the housing only if it is being replaced.

PARTS REPAIR OR REPLACEMENT

Nicks and scratches may be removed from the rotor slip rings by turning down the slip rings. Remove only enough to clean up the surface. If the slip rings are badly damaged, they should be replaced. Repair any broken lead wires.

ASSEMBLY

1. If the drive end bearing was removed, press the new bearing into the drive end housing putting pressure on the outer race only. Install the bearing retainer.
2. Place the bearing spacer on the drive end shaft and press the drive end bearing on the shaft tight against the spacer. Put pressure on the inner race only.
3. If the brush end housing bearing was removed, press a new bearing into the housing flush with the outer surface of the housing.
4. Position the two diode plate

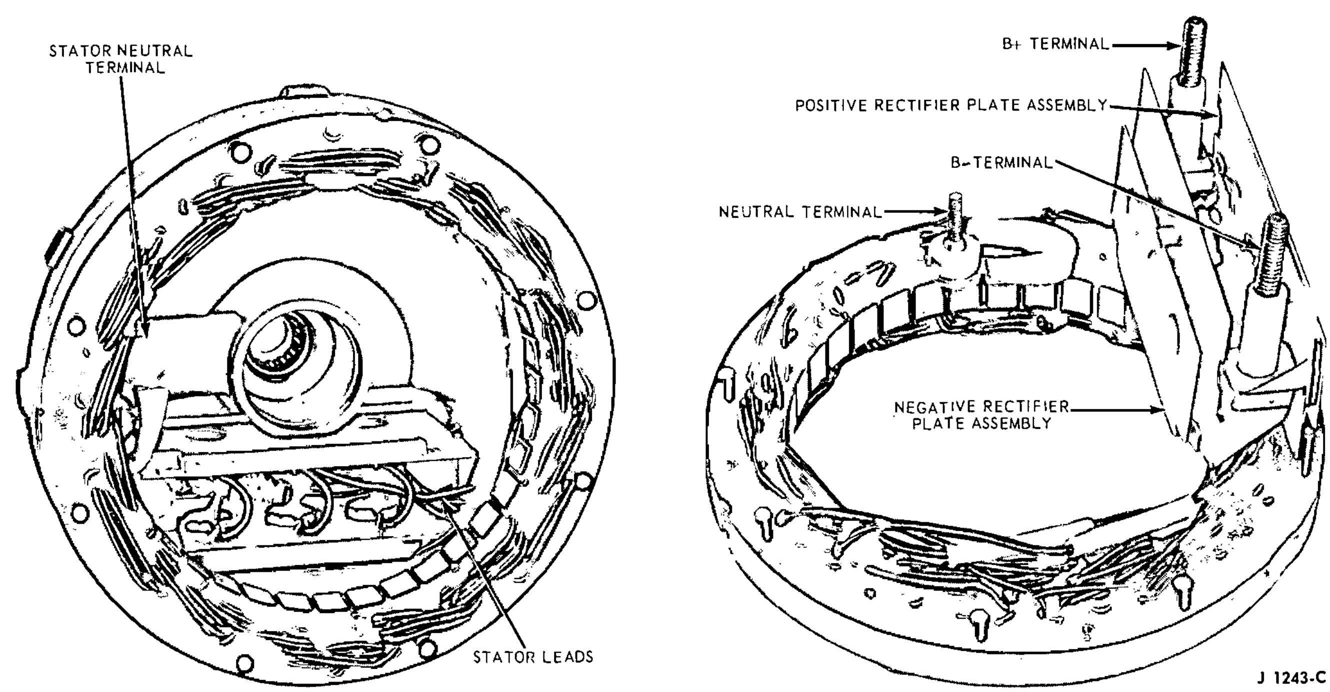


FIG. 3—Diode Plate and Stator Assembly

assemblies together with the insulators and terminal bolts as shown in Fig. 3. The positive diode plate is positioned closest to the outside.

5. Position the eyelets over the diode leads, insert the three stator leads in the eyelets and solder them in position.

6. Position the brush end housing over the diode plate assembly and install the insulators, washers and terminal nuts. The condenser ground lug is mounted under the ground terminal nut. Make certain that the stator leads are positioned out of the way of the rotor (Fig. 3).

7. Position the rotor and drive end housing and the stator and brush end housing together. Align the housing scribe marks and install the housing through bolts.

8. Install the slip rings brushes and brush holder.

PART 13-5— Leece Neville Alternator Regulators

1 DESCRIPTION AND OPERATION

The alternator regulators are composed of two control units mounted as an assembly (Fig. 1). The units are similar in operation to those used on the standard alternator regulator and consist of a double-contact voltage limiter and a field relay.

Two regulators are used. The regulator used with an ammeter charge indicator has three terminals, battery (BAT), ignition (IGN), and field (FLD). The regulator used with the charge indicator light has four terminals; three on the front, battery (BAT), light (LAMP), and field (FLD); one on the back, neutral (NEUT). The replacement regulator has five terminals including an ignition terminal (IGN).

Refer to Wiring Diagram Manual Form 7795P-67 for locations of wiring harnesses. Schematics are shown in Group 19 of this manual.

FIELD RELAY

The field relay (Fig. 1) is controlled by the ignition switch, on cars with an ammeter, and by alternator neutral junction voltage on cars with a charge indicator light. The field relay connects the battery to the alternator field through the voltage limiter contacts.

VOLTAGE LIMITER

The voltage limiter holds the alternator voltage within a predetermined range by controlling the amount of current supplied to the rotating field.

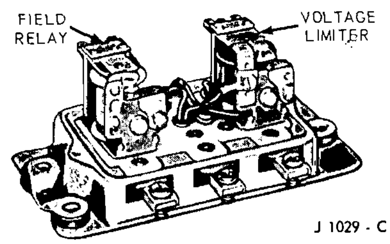


FIG. 1—Leece Neville Alternator Regulator

2 ADJUSTMENTS AND REPAIRS

REGULATOR ADJUSTMENTS

Final checking of the regulator must be made with the regulator at normal operating temperature and the cover in place. For any of the adjustments given below, remove the cover by removing the two mounting screws.

REGULATOR GAP ADJUSTMENTS

Make the regulator gap adjustments with the regulator removed from the car.

Voltage Limiter

Adjust the contact gap first. Loosen the contact-gap adjusting arm lock screw (Fig. 2), and adjust the contact gap to specification (Part 13-7). Tighten the lock screw. Adjust the core gap with the lower contacts closed. Loosen the core gap lock screw and move the contact insulator up or down until the specified core gap is arrived at between the coil core and the armature. Tighten lock screw.

Field Relay

Adjust the core gap first. Loosen the field relay air gap lock screw and move the contact insulator up or down until the specified core air gap is arrived at between the coil core and the armature. Tighten the lock screw. Put the blade of a small screw driver in the field relay adjusting arm slot (Fig. 2), and bend the arm to obtain the specified contact gap (Part 13-7).

REGULATOR VOLTAGE ADJUSTMENTS

Voltage Limiter

To increase the voltage setting, bend the adjusting arm downward (Fig. 3). To decrease the voltage setting, bend the adjusting arm upward (Fig. 3). **Before adjusting the voltage, and before making a final voltage reading with the cover in place, cycle the alternator. Reduce the alternator speed to zero and turn the ignition switch to OFF momentarily. This procedure must be repeated each time an adjustment is made.**

Field Relay

The field relay cut-in voltage is increased by bending the adjusting arm downward, or decreased by bending the adjusting arm upward (Fig. 3).

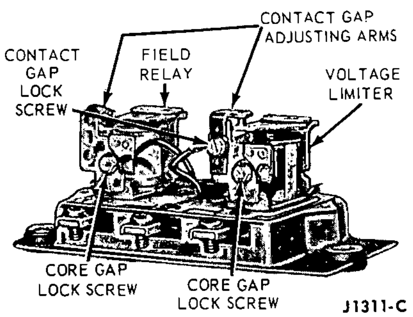


FIG. 2—Regulator Gap Adjustments

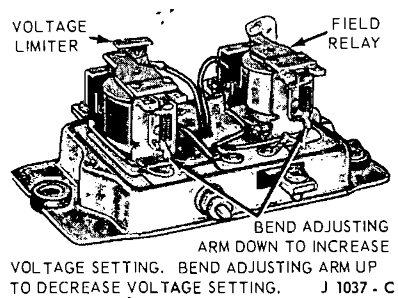


FIG. 3—Alternator Regulator Adjustments— Typical

3 REMOVAL AND INSTALLATION

1. Disconnect the battery ground cable.
2. Remove the wires from the regulator.
3. Remove the regulator mounting screws and the regulator.
4. Position the regulator and install the mounting screws. Mount the black-red strip ground wire lug under the mounting screw at the ground strap end of the regulator. (Fig. 4. 5 or 6).
5. Connect the remaining regulator wires (Fig. 4, 5 or 6).
6. Connect the battery ground cable and check the regulator operation.

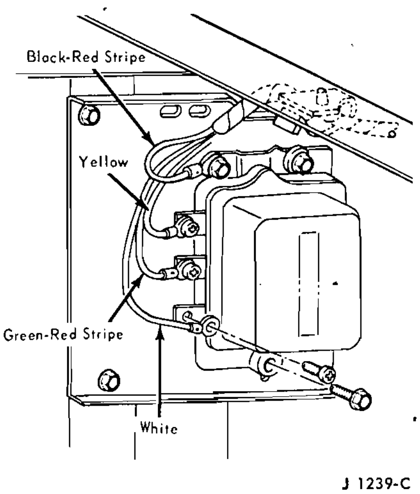


FIG. 4—Regulator Mounting—Ammeter Circuit

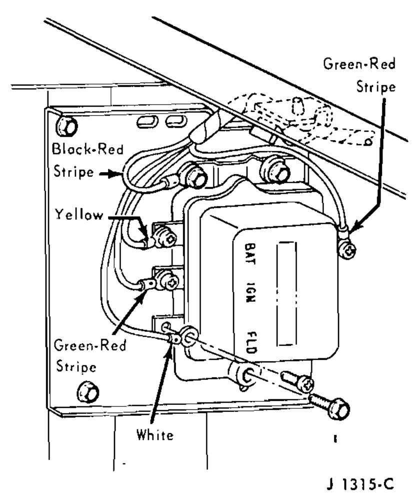


FIG. 5—Regulator Mounting—Indicator Light Circuit

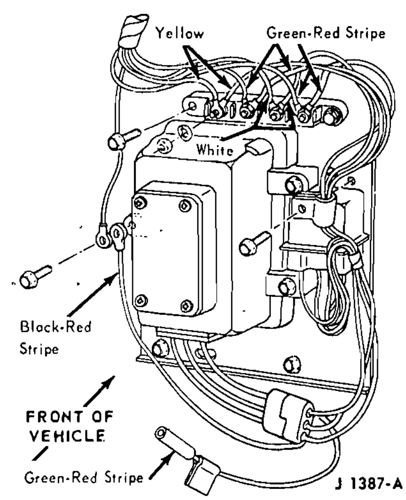


FIG. 6—Regulator Mounting—Transistor Regulator

PART 13-6— *Specifications*

ALTERNATOR

Supplier	Stamp Color	Rating: Amperes @ 15V	Rating: Watts @ 15V	Field Current Amps @ 12V	Cut-In Speed (Engine rpm)	Rated Output Speed (Engine rpm): Cold	Rated Output Speed (Engine rpm): Hot	Slip-Ring Turning (Inches): Min. Dia.	Slip-Ring Turning (Inches): Max. Runout	Brush Length (Inches): New	Brush Length (Inches): Wear Limit	Pulley Nut Torque (Ft-Lbs)	Belt ① Tension (Lbs)
Autolite	Purple	38	570	2.4	400	2000	2900	1.22	0.0005	1/2	5/16	60–100	70–110
Autolite	Orange	42	630	2.9	400	2000	2900	1.22	0.0005	1/2	5/16	60–100	70–110
Autolite	Red	55	825	2.9	400	2000	2900	1.22	0.0005	1/2	5/16	60–100	70–110
Leece-Neville	–	53	795	2.9	400	1700	2100	Light Cut	0.002	5/8	3/8	30–50	70–110

① Used Belt. New Belt 140. A used belt is one that has been in operation more than 10 minutes. If belt tension is out of specification, or belt has been removed, reset to 110 lbs.

REGULATOR

Supplier	Current Rating	Lower Stage Voltage Regulation All Models: Temp °F	Lower Stage Voltage Regulation All Models: Setting	Voltage Limiter: Contact Gap (Inches)	Voltage Limiter: Core Air Gap (Inches)	Field Relay: Contact Gap (Inches)	Field Relay: Core Air Gap (Inches)	Field Relay: Closing Volts
Autolite	Used With All Autolite Alternators ①	50	14.1–15.1	–	–	–	0.010–0.018 With Contacts Touching	2.5–4
Autolite	Transistor Regulator Used With 60-Ampere Alternator	75 100	13.9–14.9 13.7–14.7	–	–	Sealed Unit	Sealed Unit	2.5–4
Leece-Neville Indicator Light Circuit	Used with 53-Ampere Leece-Neville Alternator	125	13.6–14.6	0.018–0.020 With Lower Contacts Closed	0.042–0.052 With Lower Contacts Closed	0.018–0.020	0.009–0.011 With Contacts Touching	1.6–2.6
Leece-Neville Ammeter Circuit	Used with 53 and 65 Ampere Leece-Neville Alternator ②			0.018–0.020 With Lower Contacts Closed	0.042–0.052 With Lower Contacts Closed	0.024–0.026	0.011–0.013 With Contacts Touching	6.2–7.2

① Silver Stamp Color is used with 38 and 42-ampere alternators. Yellow Stamp Color is used with a 55-ampere alternator.
② The Autolite transistor regulator is also available with some Leece-Neville Alternators.

SPECIAL TOOLS

Ford Tool No.	Former No.	Description
T63L-8620-A	8620 BT-33-73-F	Belt Tension Gauge
T65P-10300-A	–	Alternator Pulley Remover

BATTERIES

Allowable Battery High Rate Charge Time Schedule

Specific Gravity Reading	Charge Rate Amperes	Battery Capacity—Ampere Hours: 45	55	70	80
1.125–1.150 ①	35	65 min.	80 min.	100 min.	115 min.
1.150–1.175	35	50 min.	65 min.	80 min.	95 min.
1.175–1.200	35	40 min.	50 min.	60 min.	70 min.
1.200–1.225	35	30 min.	35 min.	45 min.	50 min.
Above 1.225	5	②	②	②	②

① If the specific gravity is below 1.125, use the indicated high rate of charge for the 1.125 specific gravity, then charge at 5 amperes until the specific gravity reaches 1.250 at 80°F.
② Charge at 5 ampere rate only until the specific gravity reaches 1.250 at 80°F.
At no time during the charging operation should the electrolyte temperature exceed 130°F.

Battery Freezing Temperatures

Specific Gravity	Freezing Temp	Specific Gravity	Freezing Temp
1.280	–90°F	1.150	+ 5°F
1.250	–62°F	1.100	+19°F
1.200	–16°F	1.050	+27°F

Battery

Battery Ampere Hours	Filler Cap Color	Number Of Plates
45	Yellow	54
55	Red	66
70	Gray	66

Starting System

GROUP 14

PART 14-1— *General Starting System Service*

1 DIAGNOSIS AND TESTING

The starting system includes the starting motor and drive, the battery, the starter relay, the starter (ignition) switch, and the necessary cables and wiring to connect the components. Vehicles equipped with an automatic transmission employ a neutral-start switch in the system which prevents operation of the starter in all selector positions except N (neutral) and P (park).

A schematic diagram of the starting circuit is shown in Fig. 1.

The majority of starting problems usually fall into one of the following situations: the starter will not crank the engine; the engine will crank at normal speed but will not start; and the starter cranks the engine very slowly.

If the engine will crank but will not start, the trouble is usually in the engine, fuel system or ignition system rather than in the starting system.

The trouble diagnosis guide (Fig. 9), along with the following procedures, may be followed to determine the cause of the difficulty and the corrective action.

ROAD SERVICE

On road service calls, connect a booster battery to the system for cases of a starter that will not crank the engine or a starter that cranks the engine very slowly. If the starter turns the engine over, but the engine still will not start, even with the booster battery attached, refer to the following charts. **Be certain that correct battery polarity is observed when using a booster battery; positive to positive, and negative to negative connection of the auxiliary cables.**

STARTER WILL NOT CRANK THE ENGINE

Refer to Fig. 9 for this symptom.

CHECK BATTERY

Using the Rotunda Battery Starter Tester perform a Battery Capacity Test by loading the battery to three times its ampere hour rating for 15 seconds. If total battery voltage is less than 9.6 volts, check specific gravity of each cell. If less than 50 points between cells, battery is low in charge.

If specific gravity test shows more than 50 points between cells, battery is defective. Charge battery and check charging system.

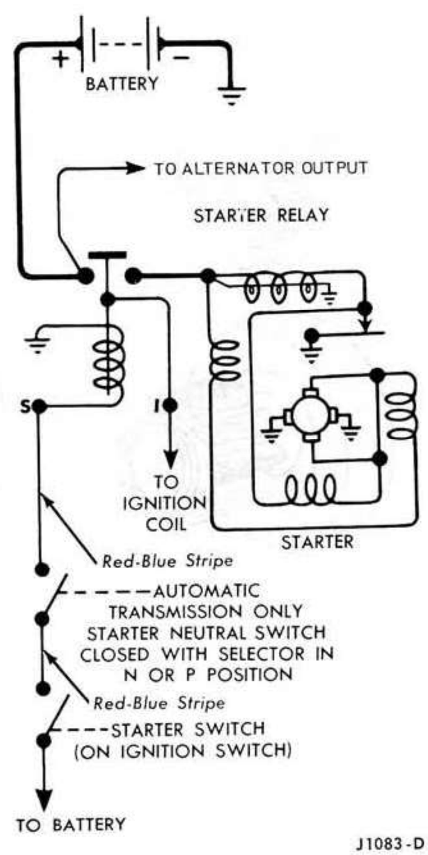


FIG. 1—Starting Circuit

CHECK BATTERY CABLES

Place a heavy jumper wire in parallel with the battery to starter relay cable and then in parallel with the battery to engine (ground) cable. If the starter now cranks the engine, the battery cable is defective. Clean the battery connections or replace the battery cables.

CHECK STARTER RELAY

Connect a jumper from the battery terminal of the relay to the S terminal of the relay (Fig. 3, connection No. 2). If the engine does not crank, the starter relay probably is at fault.

CHECK STARTER DRIVE AND STARTER

Operate the ignition switch and listen for starter noise. If the starter rotates or makes a distinct clunk but will not crank the engine, the drive is defective. Whenever possible, remove the plunger cover and obsert the plunger pole operation on the vehicle. Do not damage the exposed switch during starter installation or removal.

Temporarily connect a heavy jumper from the battery positive terminal to the starter terminal of the starter relay. If the starter will not crank the engine, the starter is defective. Repair or replace the starter.

Pinion And Ring Gear Wear

Examine the wear pattern on the starter drive teeth. The pinion teeth must penetrate to a depth greater than 1/2 the ring gear tooth depth (Fig. 2), to eliminate premature ring gear and starter drive failure.

Replace starter drives and ring gears with milled, pitted or broken teeth or that show evidence of inadequate engagement (Fig. 2).

CHECK NEUTRAL START SWITCH

On vehicles equipped with an automatic transmission, apply the brakes and attempt to start the engine while moving the transmission selector lever through all ranges. This may determine if the problem is caused by a maladjusted or defective neutral-start switch. Refer to Group 7 Part 3 for the adjustment of this switch.

Place the selector lever in N or P and set the brakes. Remove the neutral start switch connector block and connect a jumper between the two red-blue stripe wires. If the engine will now crank the neutral start switch is defective. Replace the switch.

CHECK STARTER CONTROL CIRCUIT TEST

On vehicles equipped with an automatic transmission, if the engine cranks, connect a jumper from the relay side of the neutral-start switch battery terminal of the relay to the (Fig. 3, connection No. 3). If the engine does not crank, the wiring between the neutral-start switch and the relay is at fault. If the engine cranks, connect a jumper from the battery terminal of the relay to the starter (ignition) switch side of the neutral-start switch (Fig. 3, connection No. 4). If the engine does not crank, the neutral-start switch is out of adjustment or defective. If the engine cranks, check for voltage at the battery terminal of the starter (ignition) switch wiring harness connector with a test light or a voltmeter. If voltage is not available, the wiring between the battery terminal of the starter relay and the battery terminal of the starter (ignition) switch is at fault. If voltage is available, substitute an ignition switch from stock. If the engine cranks, replace the ignition switch. If the engine still will not crank, the trouble is in the wiring or connections between the ignition switch and the starter-neutral switch.

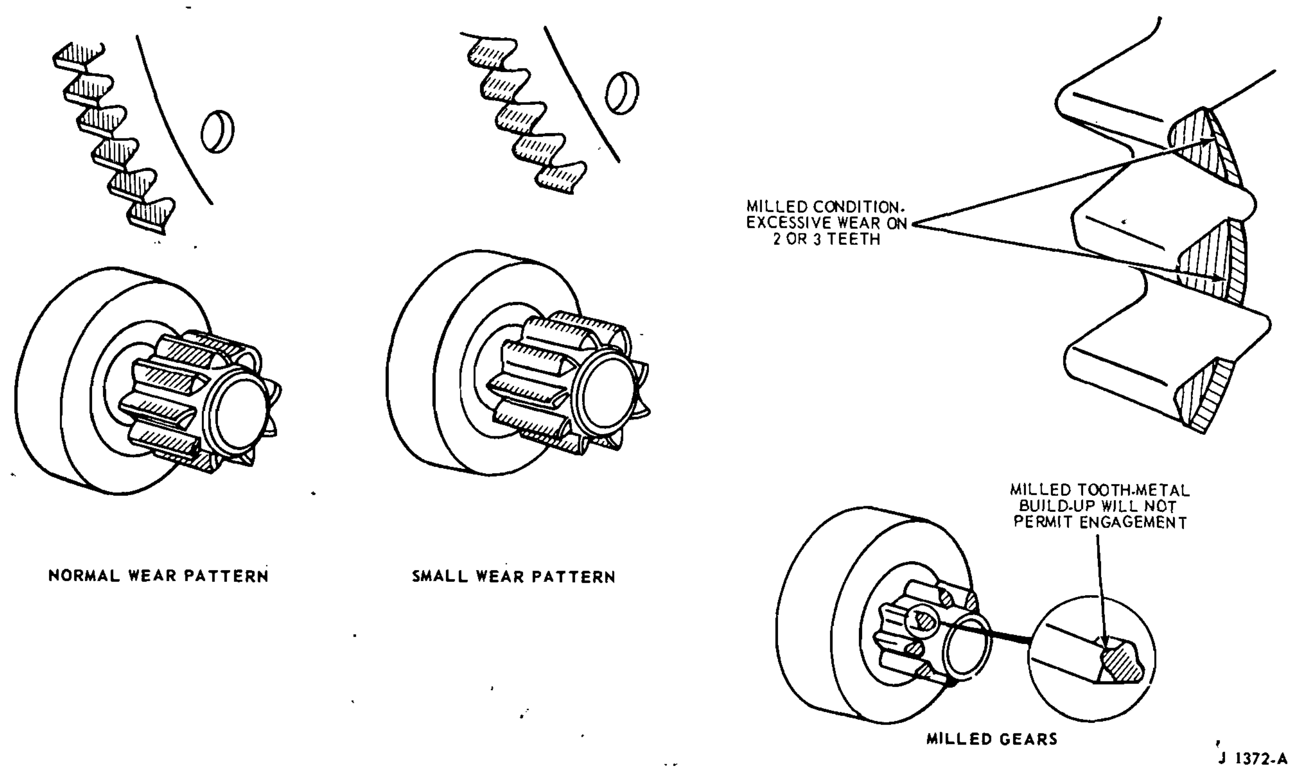


FIG. 2—Pinion and Ring Gear Wear Patterns

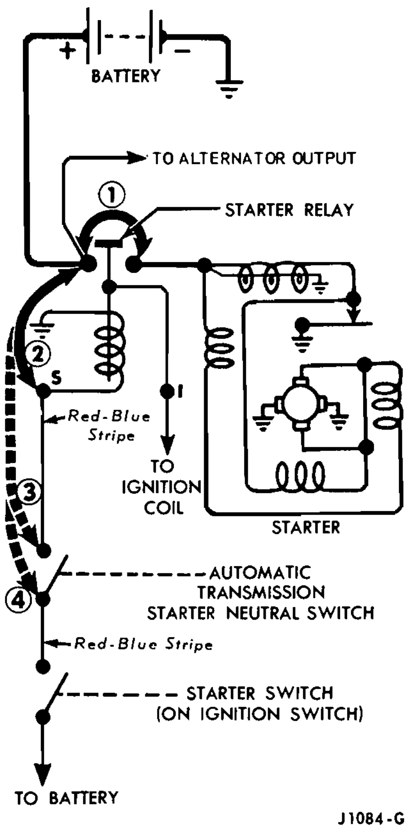


FIG. 3–Starting Control Circuit Tests

CHECK ENGINE

Remove the spark plugs. Remove the coil high tension lead wire at the distributor and ground it to the engine. Try to crank the engine with the starter. If the engine cranks, it indicates that water is leaking into the cylinders.

With the spark plugs removed and coil to distributor high tension lead grounded to the engine, attempt to crank the engine with the starter. If the engine does not crank or cranks very slowly, a seized engine is indicated.

ENGINE CRANKS SLOWLY BUT WILL NOT START

Refer to Fig. 9 for this symptom. Make the following checks as covered under Starter Will Not Crank The Engine: Check Battery, Check Battery Cables, Check Starter Relay. Check Starter Drive and Starter. In addition make the following checks:

Examine the dipstick for congealed engine oil. Check the car owner regarding the viscosity and grade of oil in the crankcase. Drain the crankcase and install the proper viscosity engine oil. Change the oil filter if required.

Check for partially seized pistons or bearings. Remove the oil pan. Check for water in the lubrication system. If water is found, remove the cylinder head and check for conbustion chamber leaks. Check for seized pistons, rings and bearings. Clean, repair or replace defective or damaged engine components.

ENGINE WILL CRANK AT NORMAL SPEED BUT WILL NOT START

Refer to Group 8 for this sympton.

STARTER LOAD TEST

Connect the test equipment as shown in Fig. 4. Be sure that no current is flowing through the ammeter and heavy-duty carbon pile rheostat portion of the circuit (rheostat at maximum counterclockwise position).

Crank the engine with the ignition OFF, and determine the exact reading on the voltmeter. This test is accomplished by disconnecting and grounding the high tension lead from the ignition coil, and by connecting a jumper from the battery terminal of the starter relay to the ignition switch terminal of the relay.

Stop cranking the engine, and reduce the resistance of the carbon pile until the voltmeter indicates the same reading as that obtained while the starter cranked the engine. The ammeter will indicate the starter current draw under load.

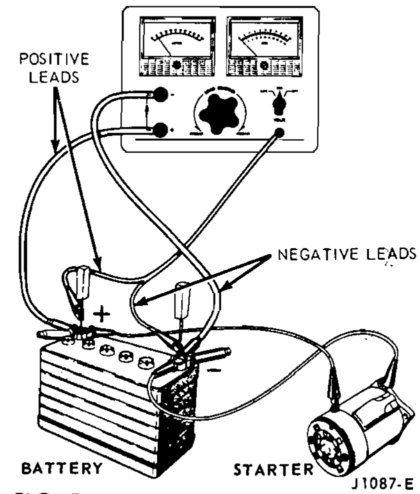


FIG. 5—Starter No-Load Test on Test Bench

STARTER NO-LOAD TEST

The starter no-load test will uncover such faults as open or shorted windings, rubbing armature, and bent arm-

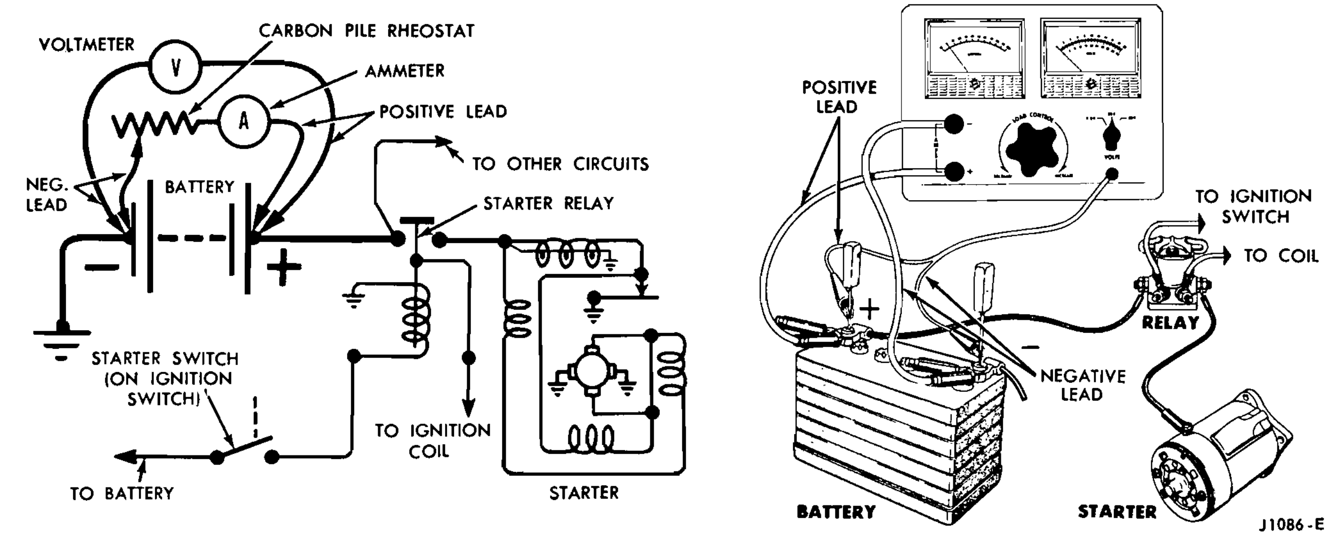


Fig. 4—Starter Load Test

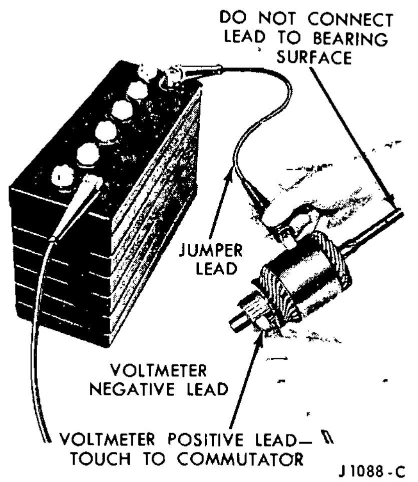


FIG. 6—Armature Grounded Circuit Test

ature shaft. The starter can be tested, at no-load, on the test bench only.

Make the test connections as shown in Fig. 5. The starter will run at no-load. Be sure that no current is flowing through the ammeter (rheostat at maximum counterclockwise position). Determine the exact reading on the voltmeter.

Disconnect the starter from the battery, and reduce the resistance of the rheostat until the voltmeter indicates the same reading as that obtained while the starter was running. The ammeter will indicate the starter no-load current draw.

ARMATURE OPEN CIRCUIT TEST—ON TEST BENCH

An open circuit armature may sometimes be detected by examining the commutator for evidence of burning. A spot burned on the commutator is caused by an arc formed every time the commutator segment, connected to the open circuit winding, passes under a brush.

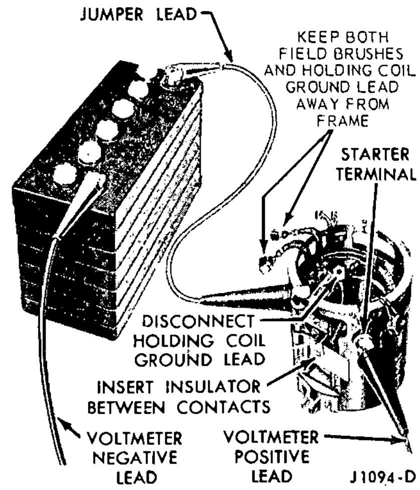


FIG. 7—Field Grounded Circuit Test

ARMATURE AND FIELD GROUNDED CIRCUIT TEST—ON TEST BENCH

This test will determine if the winding insulation has failed, permitting a conductor to touch the frame or armature core.

To determine if the armature windings are grounded, make the connections as shown in Fig. 6. If the voltmeter indicates any voltage, the windings are grounded.

Grounded field windings can be detected by making the connections as shown in Fig. 7. If the voltmeter indicates any voltage, the field windings are grounded.

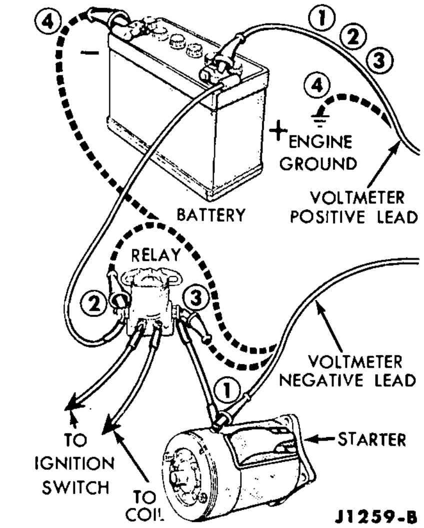


FIG. 8-Starter Cranking Circuit Test

STARTER CRANKING CIRCUIT TEST

Excessive resistance in the starter circuit can be determined from the results of this test. Make the test connections as shown in Fig. 9. Crank the engine with the ignition OFF. This is accomplished by disconnecting and grounding the high tension lead from the ignition coil and by connecting a jumper from the battery terminal of the starter relay to the S terminal of the relay.

The voltage drop in the circuit will be indicated by the voltmeter (0 to 2

STARTER WILL NOT CRANK ENGINE	**1.** Battery low in charge. **2.** Defective battery. **3.** Corroded battery cables or connections. **4.** Defective starter relay. **5.** Defective starter drive. **6.** Defective starter. **7.** Maladjusted neutral start switch (if used).	**8.** Defective neutral start switch (if used). **9.** Defective ignition switch. **10.** Defective wiring from ignition switch through neutral start switch (if used), to starter relay. **11.** Hydrostatic lock. **12.** Engine has seized pistons or bearings.
ENGINE CRANKS SLOWLY BUT WILL NOT START	**1.** Battery low in charge. **2.** Defective battery. **3.** Corroded battery cables. **4.** Defective starter relay. **5.** Defective starter.	**6.** Incorrect viscosity engine oil in crankcase. **7.** Pistons or bearings partially seized.

FIG. 9—Starter System Trouble Diagnosis Guide

volt range). Maximum allowable voltage drop should be:

1. With the voltmeter negative lead connected to the starter terminal and the positive lead connected to the battery positive terminal (Fig. 8, connection ①) .... 0.5 volt.

2. With the voltmeter negative lead connected to the battery terminal of the starter relay and the positive lead connected to the positive terminal of the battery (Fig. 8, connection ②) .... 0.1 volt.

3. With the voltmeter negative lead connected to the starter terminal of the starter relay and the positive lead connected to the positive terminal of the battery (Fig. 8, connection ③) .... 0.3 volt.

4. With the voltmeter negative lead connected to the negative terminal of the battery and the positive lead connected to the engine ground (Fig. 8, connection ④)............ 0.1 volt.

PART 14-2— Starter

1 DESCRIPTION AND OPERATION

The function of the starting system is to crank the engine at high enough speed to permit it to start. The system includes the starter motor and drive, the battery, a remote control starter switch (part of the ignition switch), the neutral-start switch, the starter relay, and heavy circuit wiring. The starter mounting is shown in Fig. 1.

Turning of the ignition key to the START position actuates the starter relay, through the starter control circuit. The starter relay then connects the battery to the starter.

Vehicles equipped with an automatic transmission have a neutral-start switch, in the starter control circuit, which prevents operation of the starter if the selector lever is not in the N(neutral) or P (park) position.

The starter utilizes an integral positive-engagement drive (Fig. 2).

When the starter is not in use, one of the field coils is connected directly to ground through a set of contacts. When the starter is first connected to the battery a large current flows through the grounded field coil, actuating a movable pole shoe. The pole shoe is attached to the starter drive plunger lever and thus the drive is forced into engagement with the flywheel.

When the movable pole shoe is fully seated, it opens the field coil grounding contacts and the starter is then in normal operation. A holding coil is used to maintain the movable pole shoe in the fully seated position, during the time that the starter is turning the engine.

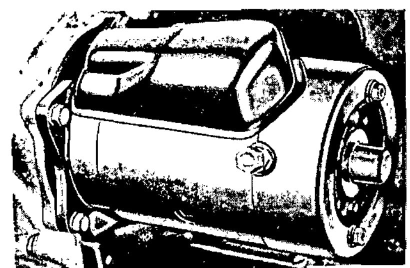


FIG. 1—Starter Mounting

2 REMOVAL AND INSTALLATION

1. Raise the vehicle on a hoist. (8-cyl. engine only).

2. Disconnect the starter cable at the starter terminal.

3. On a Comet with power steering (8-cyl. engine), disconnect and lower the idler arm from the frame. Push the bolts back through the frame.

4. Remove the starter mounting bolts. Remove the starter assembly.

5. Position the starter assembly to the flywheel housing, and start the mounting bolts.

6. Snug all bolts while holding the starter squarely against its mounting surface and fully inserted into the pilot hole. Torque the bolts to specification.

7. Connect the starter cable.

8. Install the idler arm (if removed), and lower the vehicle.

3 COMMON ADJUSTMENTS AND REPAIRS

STARTER DRIVE REPLACEMENT

1. Loosen and remove the brush cover band and the starter drive plunger lever cover.

2. Loosen the through bolts enough to allow removal of the drive end housing and the starter drive plunger lever return spring. If the starter has a needle bearing, and the bearing is not being replaced, insert a dummy shaft in the housing to prevent loss of any of the bearing needles. Before assembly, apply a small amount of grease to the needles.

3. Remove the pivot pin retaining the starter drive plunger lever and remove the lever.

4. Remove the drive gear stop ring retainer and stop ring from the end of the armature shaft and remove the drive gear assembly.

5. Apply a thin coating of Lubriplate 777 on the armature shaft splines. Install the drive gear assembly on the armature shaft and install a new stop ring.

6. Position the starter gear plunger lever on the starter frame and install the pivot pin. **Be sure that the plunger lever properly engages the starter drive assembly.**

7. Install a new stop-ring retainer. Position the starter drive plunger lever return spring and drive end housing to the starter frame, and then tighten

the through bolts to specifications (55-75 inch pounds).

8. Position the starter drive plunger lever cover and the brush cover band, with its gasket, on the starter. Tighten the brush cover band retaining screw.

BRUSH REPLACEMENT

Replace the starter brushes when they are worn to 1/4 inch. Always install complete set of new brushes.

1. Loosen and remove the brush cover band, gasket, and starter drive plunger lever cover. Remove the brushes from their holders.
2. Remove the two through bolts from the starter frame.
3. Remove the drive end housing, and the plunger lever return spring. If the starter has a needle bearing, and the bearing is not being replaced, insert a dummy shaft in the housing to prevent loss of any of the bearing needles. Before assembly, apply a small amount of grease to the needles.
5. Remove the brush end plate.
6. Remove the ground brush retaining screws from the frame and remove the brushes (cut the ground brush nearest the starter terminal from the brush terminal block, as close to the brush lead terminal as possible).
7. Cut the insulated brush leads from the field coils, as close to the field connection point as possible.
8. Clean and inspect the starter motor.
9. Replace the brush end plate if the insulator between the field brush holder and the end plate is cracked or broken.
10. Position the new insulated field brushes lead on the field coil connection. Position and crimp the clip provided with the brushes to hold the brush lead to the connection. Solder the lead, clip, and connection together, using rosin core solder (Fig. 5). Use a 300-watt iron.
11. Install the ground brush leads to the frame with the retaining screws. The ground brush with the over-size unthreaded hole is placed under the terminal from which the previous ground brush was cut.
12. Clean the commutator with # 00 or # 000 sandpaper.
13. Position the brush end plate to the starter frame, with the end plate boss in the frame slot.
14. Position the fiber washer on the commutator end of the armature shaft and install the armature in the starter frame.
15. Install the starter drive gear plunger lever to the frame and starter drive assembly, and install the pivot pin.
16. Position the return spring on the plunger lever, and the drive end housing to the starter frame. Install the through bolts and tighten to specified torque (55-75 inch pounds). Be sure that the stop ring retainer is seated properly in the drive end housing.
17. Install the commutator brushes in the brush holders. Center the brush springs on the brushes.
18. Position the plunger lever cover and the brush cover band, with its gasket, on the starter. Tighten the band retaining screw.
19. Connect the starter to a battery to check its operation.

ARMATURE REPLACEMENT

1. Loosen the brush cover band retaining screw and remove the brush cover band, gasket, and the starter drive plunger lever cover. Remove the brushes from their holders.
2. Remove the through bolts, the drive end housing, and the drive plunger lever return spring. If the starter has a needle bearing, and the bearing is not being replaced, insert a dummy shaft in the housing to prevent loss of any of the bearing needles. Before assembly, apply a small amount of grease to the needles.
3. Remove the pivot pin retaining the starter gear plunger lever, and remove the lever.
4. Remove the armature. If the starter drive gear assembly is being reused, remove the stop ring retainer and the stop ring from the end of the armature shaft, and remove the drive.
5. Place the drive gear assembly on the new armature with a new stop ring.
6. Install the fiber thrust washer on the commutator end of the armature shaft and install the armature.
7. Position the drive gear plunger lever to the frame and drive gear assembly and install the pivot pin.
8. Position the drive plunger lever return spring, the drive end housing, and the brush end plate to the starter frame, and then install and tighten the through bolts to specification. Be sure that the stop ring retainer is seated properly in the drive housing. If the starter has needle bearings apply a small amount of grease to the needles before installing the drive housing.
9. Place the brushes in their holders, and center the brush springs on the brushes.
10. Position the plunger lever cover and the brush cover band, with its gasket, and then tighten the retaining screw.
11. Connect the starter to a battery to check its operation.

4 MAJOR REPAR OPERATIONS

Use the following procedure when it becomes necessary to completely overhaul the starter. Fig. 2 illustrates a partially disassembled starter.

DISASSEMBLY

1. Loosen the brush cover band retaining screw and remove the brush cover band and the starter drive plunger lever cover. Observe the lead position for assembly and then remove the commutator brushes from the brush holders.
2. Remove the through bolts, starter drive end housing, and the starter drive plunger lever return spring. If the starter has needle bearings, and the bearing is not being replaced, insert a dummy shaft in the housing to prevent loss of any of the bearing needles. Before assembly, apply a small amount of grease to the needles.
3. Remove the pivot pin retaining the starter gear plunger lever and remove the lever and the armature.
4. Remove the stop ring retainer. Remove and discard the stop ring retaining the starter drive gear to the end of the armature shaft, and remove the starter drive gear assembly.
5. Remove the brush end plate.
6. Remove the two screws retaining the ground brushes to the frame.
7. On the field coil that operates the starter drive gear actuating lever, bend the tab up on the field coil retaining sleeve and remove the sleeve.
8. Remove the three coil retaining screws, using tool 10044-A and an arbor press (Fig. 3). The arbor press prevents the wrench from slipping out of the screw. Unsolder the field coil leads from the terminal screw, and remove the pole shoes and coils from the frame (use a 300-watt iron).
9. Cut (or unsolder) the insulated brush leads from the field coils, as close to the field connection point as possible.
10. Remove the starter terminal nut, washer, insulator and terminal from the starter frame. Remove any excess solder from the terminal slot.

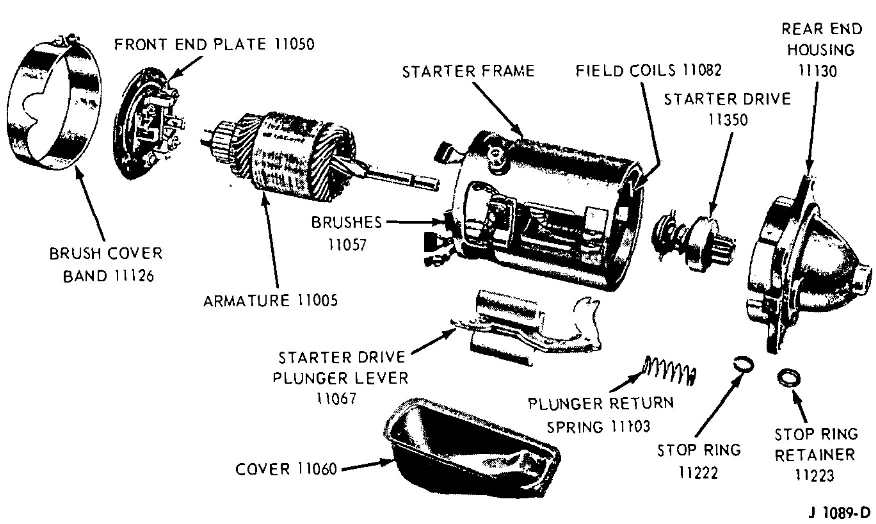


FIG. 2—**Starter Disassembled**

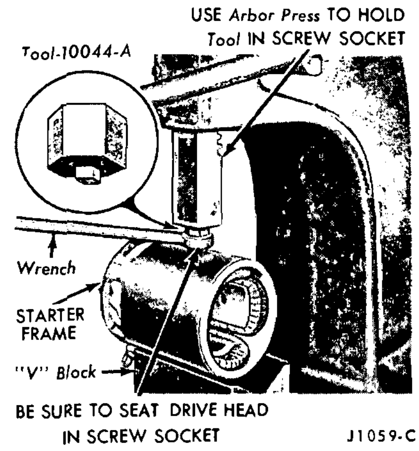


FIG. 3—**Pole Shoe Screw Removal**

CLEANING AND INSPECTION

1. Use a brush or air to clean the field coils, armature, commutator, armature shaft, brush end plate, and drive end housing. Wash all other parts in solvent and dry the parts.
2. Inspect the armature windings for broken or burned insulation and unsoldered connections.
3. Check the armature for open circuits and grounds.
4. Check the commutator for run-out (Fig. 4). Inspect the armature shaft and the two bearings for scoring and excessive wear. On a starter with needle bearings apply a small amount of grease to the needles. If the commutator is rough, or more than 0.005 inch out-or-round, turn it down.
5. Check the brush holders for broken springs and the insulated brush holders for shorts to ground. Tighten any rivets that may be loose. Replace the brushes if worn to 1/4 inch in length.
6. Check the brush spring tension. Replace the springs if the tension is not within specified limits (40 ounces minimum).
7. Inspect the field coils for burned or broken insulation and continuity. Check the field brush connections and lead insulation. A brush kit and a contact kit are available. All other assemblies are to be replaced rather than repaired.

ASSEMBLY

1. Install the starter terminal, insulator, washers, and retaining nut in the frame (Fig. 5). Be sure to position the slot in the screw perpendicular to the frame end surface.

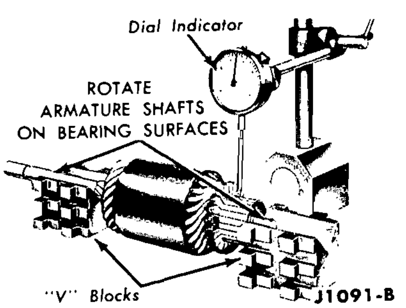


FIG. 4—**Commutator Runout Check**

2. Position the coils and pole pieces, with the coil leads in the terminal screw slot, and then install the retaining screws (Fig. 3). As the pole shoe screws are tightened, strike the frame several sharp blows with a soft-faced hammer to seat and align the pole shoes, then stake the screws.
3. Install the solenoid coil and retainer and bend the tabs to retain the coils to the frame.
4. Solder the field coils and solenoid wire to the starter terminal using rosin core solder. Use a 300-watt iron.
5. Check for continuity and grounds in the assembled coils.
6. Position the new insulated field brushes lead on the field coil terminal. Install the clip provided with the brushes to hold the brush lead to the terminal. Solder the lead, clip, and terminal together, using rosin core solder (Fig. 4). Use a 300-watt iron.
7. Position the solenoid coil ground terminal over the nearest ground screw hole.

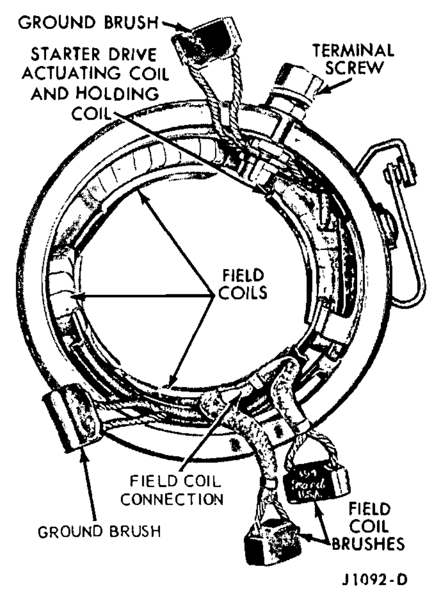


FIG. 5—**Field Coil Assembly**

8. Position the ground brushes to the starter frame and install the retaining screws (Fig. 4).
9. Position the starter brush end plate to the frame, with the end plate boss in the frame slot.
10. Apply a thin coating of Lubriplate 777 on the armature shaft splines. Install the starter motor drive gear assembly to the armature shaft and install a new retaining stop ring. Install a new stop ring retainer.
11. Position the fiber thrust washer on the commutator end of the armature shaft and position the armature in the starter frame.

12. Position the starter drive gear plunger lever to the frame and starter drive assembly, and install the pivot pin.

13. Position the starter drive plunger lever return spring and the drive end housing to the frame and install and tighten the through bolts to specification (55-75 inch pounds). **Do not pinch the brush leads between the brush plate and the frame.** Be sure that the stop ring retainer is seated properly in the drive housing.

14. Install the brushes in the brush holders. **Be sure to center the brush springs on the brushes.**

15. Position the drive gear plunger lever cover on the starter and install the brush cover band with a gasket. Tighten the band retaining screw.

16. Check the starter no-load amperage draw.

PART 14-3— Specifications

STARTERS

Starter Motor						Starter Brushes				Mounting Bolt Torque (Ft-Lbs)	
Dia. (Inches)	Current Draw Under Normal Load (Amps.)	Normal Engine Cranking Speed (rpm)	Min. Stall Torque @ 5 Volts (Ft-Lbs)	Max. Load (Amps.)	No. Load (Amps.)	Mfg. Length (Inches)	Wear Limit (Inches)	Spring Tension (Ounces)	Through Bolt Torque (In-Lbs)	3/8-In Bolt Two-Hole Mtg.	5/16-In Bolt Three-Hole Mtg.
4	150–165	250–290	9.0	460	70	0.50	0.25	40	55–75	15–20	12–15
4-1/2	150–180	250–290	15.5	670	70	0.50	0.25	40	55–75	15–20	12–15
Maximum Commutator runout is 0.005 inch. Maximum starting circuit voltage drop (battery positive terminal to starter terminal) at normal engine temperature is 0.5 volt.											

SPECIAL TOOLS

Tool Number	Description
Tool 10044-A	Generator Pole Screw Wrench

Lighting System, Horns And Instruments

GROUP 15

PART 15-1—*General Lighting System, Horns and Instruments Service*

1 DIAGNOSIS AND TESTING

DIAGNOSIS

Refer to Figs. 4 through 12 for lighting system horns and instruments trouble diagnosis.

TESTING

Refer to Wiring Diagram Manual Form 7795P-67 for locations of wiring harnesses. Schematics are shown in Group 19 of this manual.

HORN TEST

The only test necessary on the horn is for current draw.

Current Draw Test

Connect a voltmeter and ammeter to the horn and to a voltage supply as shown in Fig. 1. The normal current draw for the horns at 12 volts is 3.5-5.5 amperes.

HEADLIGHT SWITCH AND BEAM SELECTOR SWITCH TESTS

The following tests may be made to determine whether a headlight switch or a beam selector switch is defective:

Turn on the headlights, and operate the beam selector switch. If none of the headlights turn on when the beam selector switch is operated, yet the instrument panel lights operate, the headlight switch or the red-yellow stripe wire from the headlight switch to the beam control switch is

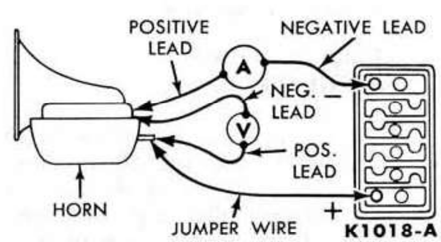


FIG. 1—**Horn Current Draw Test**

probably defective. Substitute a known good switch for the suspected switch to determine whether the switch or the wiring is at fault.

If the headlights operate only with the beam selector switch in one position, the selector switch or the wiring from the switch to the headlight is defective. Substitute a known good selector switch for the suspected

switch to determine whether the switch or the wiring is at fault.

INSTRUMENT VOLTAGE REGULATOR TEST

Turn the ignition switch on, check for voltage at the gauge feed wire (black with green stripe) at one of the gauges. The voltage should oscillate between zero and about 10 volts. If it does not, the constant voltage regulator is defective, or there is a short to ground between the voltage regulator and the gauges.

If a gauge unit is inaccurate or does not indicate, replace it with a new unit. If the gauge unit still is erratic in its operation, the sending unit or wiring to the sending unit is faulty.

If both the fuel gauge and the temperature gauge indicate improperly and in the same direction, the constant voltage regulator could be defective, as it supplies both gauges.

FUEL GAUGE AND FUEL LEVEL SENDING UNIT TEST

Disconnect the wire from the fuel level sending unit and connect it to a known good sending unit. Using a jumper for a ground, connect it to the sending unit mounting plate and car frame. Raise the float arm to the upper stop, the instrument panel gauge should read full. Lower the float arm to the bottom stop, the gauge should read empty.

If the gauge reads properly, the sending unit in the gas tank is defective.

If the gauge unit still indicates improperly or is erratic in its operation, the gauge unit or the wiring to the gauge unit is faulty. Repair the wire or replace the gauge unit.

TEMPERATURE GAUGE TEST

Start the engine and allow it to run at 1200 rpm for 30 minutes. Place a thermometer in the coolant at the radiator filler cap. The temperature should read a minimum of 180 ° F., and the gauge in the instrument panel should indicate within the normal band.

If the gauge does not indicate, short the temperature sender unit terminal wire to ground (ignition switch on). **Do not leave the sender wire grounded longer than necessary to make the test, as the gauge may be damaged.** If the gauge now indicates, the sender unit is defective or not properly sealed to the engine. **Be sure to use an electrically conductive sealer C3AZ-19554-B.** If the gauge does not indicate, the gauge, the wires leading to the gauge, or the constant voltage regulator are at fault.

OIL PRESSURE INDICATOR LIGHT TEST

To test the indicator light, turn on the ignition switch. Do not start the engine. The light should come on. Start the engine. The light should go out, indicating that the oil pressure has built up a safe value.

To test the oil pressure switch on the engine, turn the ignition switch on, engine not running, the indicator light should come on. If the indicator light does not come on, short the terminal of the oil pressure switch unit to ground. If the light now comes on, the oil pressure switch is defective or not properly sealed to the engine. **Be sure to use electrically conductive sealer C3AZ-19554-B.** If the light still does not come on, the bulb is burned out or the wires from the bulb to the ignition switch and oil pressure switch are defective.

OIL PRESSURE INDICATOR GAUGE TEST

Remove the oil pressure sender unit and temporarily attach an oil pressure gauge in its place. Operate the engine to determine the oil pressure. If the oil pressure is normal, the gauge should indicate within the normal band.

If the gauge did not indicate, **momentarily** short the oil pressure sender wire to ground. **Do not leave the sender wire grounded longer than necessary to make the test, as the gauge may be damaged.** If the gauge now indicates, the sender unit is defective or not properly sealed to the engine. **Be sure to use electrically conductive sealer C3AZ-19554-B.** If the gauge does not indicate, the gauge, the wires leading to the gauge or the constant voltage regulator are at fault.

The sending unit used with the warning indicator light system is not interchangeable with the sending unit used with the gauge system. Refer to the Ford Car Master Parts Catalog for proper parts usage.

Misuse of the sending units will result in inoperative oil pressure warning systems and damaged sending units or gauges.

CHARGE INDICATOR LIGHT TEST

To test the charge indicator light, turn the ignition switch on with the engine stopped. The light should come on. If it does not, the bulb is burned out, or the wiring to the light is defective.

An open resistor wire in the Ford alternator charging system wiring harness will usually cause the charge indicator light to stay on until the engine speed is increased to several thousand rpm. This effect will be noticed each time the engine is started. In some cases the light will not go out at all.

The charge indicator light may be tested with the use of a test light containing a trade number 67 or 1155 bulb.

Disconnect the regulator plug from the regulator. Turn the ignition switch to ACC position. Touch one test probe from test light to the ignition terminal and the other to the regulator base. The test light will come on if the circuit is in proper working order. If the 15 ohm resistor or circuit is open, the indicator light will operate at full brightness and the test light will be out.

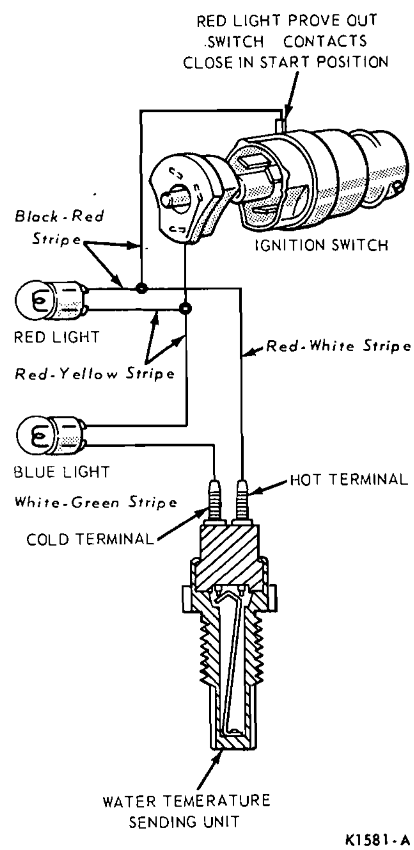


FIG. 2–Temperature Indicator Light System

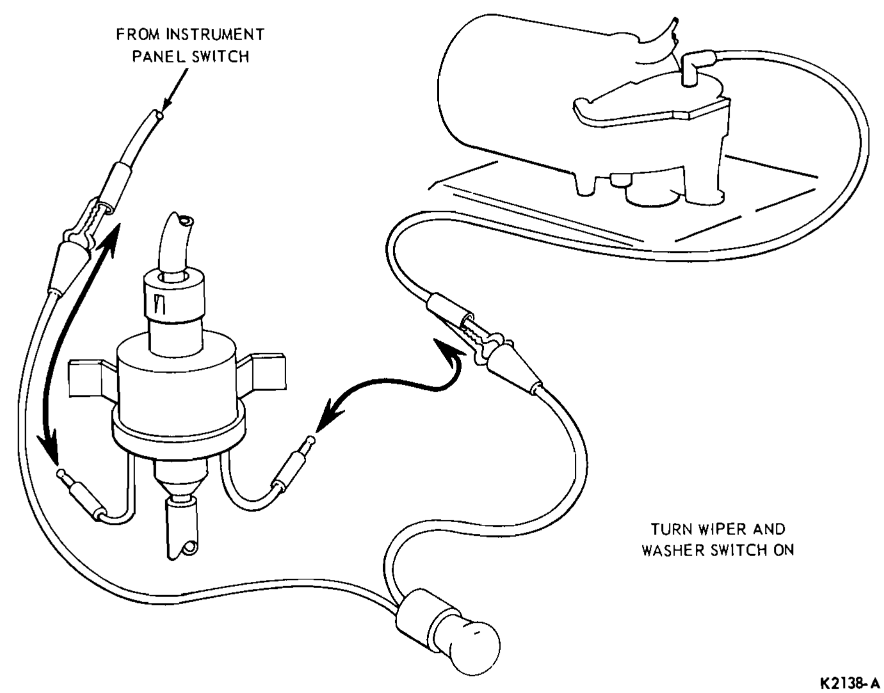


FIG. 3— Windshield Washer Pump Test—Except Cougar

AMMETER TEST

To test the ammeter, turn the headlights on with the engine stopped. The meter pointer should move toward the D or discharge scale. If no movement of the needle is observed, check the rear of the meter housing to see if the battery to circuit breaker wire connections are loose. If the connections are tight, and the meter does not indicate a discharge, the meter is inoperative. If the meter pointer moves toward the C or charge scale when the headlights are turned ON, the wire connections at the meter are reversed. When the headlights are turned on, the battery is reversed, or the wire passes through the loop in the wrong direction. Feed the wire through in the opposite direction to correct this condition, after checking first to make sure that the battery is not reversed.

SPEEDOMETER TESTS

To test the odometer accuracy, drive the car over a measured mile. Speedometer accuracy can be checked by comparing the speedometer in question against one known to be accurate, while two cars are moving at the same speed, or by timing the car on a measured mile. The Ford Car Master Parts Catalog or the Lincoln-Mercury Parts and Accessories Catalog show the proper combination of gears to use for various rear axle and tire size combinations.

TEMPERATURE INDICATING LIGHT SYSTEM TEST

The temperature indicating system consists of a sending unit mounted in the cylinder head and remote registering units (temperature indicating lights) mounted on the instrument panel (Fig. 2). When the engine is cold and the ignition switch is in the ACC or IGN position, the blue light flashes on. When the temperature of the engine coolant reaches approximately 125 ° F., the blue light will go out. Should the temperature of the engine coolant reach approximately 245 ° F., the red light will flash on indicating a malfunction in the engine cooling system. These lights are controlled by the temperature sending unit, which through a bimetallic arm completes the circuit to ground. With the ignition switch in the start position, the red light should flash on even though the engine is cold, thus proving that the red light is operable (Fig. 2). A set of contacts in the ignition switch completes the proving circuit to ground.

ELECTRIC WINDSHIELD WASHER PUMP TEST—EXCEPT MUSTANG AND COUGAR

To test the operation of the windshield washer pump, connect a test light indicator as illustrated in Fig. 3. If the test light flashes, the pump is defective and should be replaced.

WINDSHIELD WASHER PUMP TEST—COUGAR, MUSTANG

Disconnect the wiring plug (individual wires on early production) from the pump and check the switch for continuity with a self powered test light. Attach the test light clip to the switch terminal that mates with the red wire, and the remaining probe to the terminal that mates with the white wire in the hard shell connector. With the pump pedal in the normal released position the test light should be out, then by depressing the pump pedal the light should turn on. If the light turns on, the low speed portion of the switch is normal.

Remove the clip and probe from the terminals and attach the clip and probe to each of the switch terminals mating with the black wires in the hard shell connector. With the pump pedal in the normal released position the test light shculd be on. When the pedal is depressed, the light should go out. If the light goes out, the off (park) position of the switch is operating normally. If the switch does not meet these conditions, replace the pump and switch assembly.

2 COMMON ADJUSTMENTS AND REPAIRS

HORN ADJUSTMENT

Horn current can be adjusted by changing the contact tension. Connect the horn as shown in Fig. 1. Turn the self-locking adjusting nut until the current is within the limits for the horn being adjusted.

3 CLEANING AND INSPECTION

TWO-SPEED WIPER MOTOR

1. Clean the gear housing of all old grease. **Do not allow any cleaning fluid to contact the armature shaft and output shaft bearings.**

2. Wipe all other parts with a clean cloth.

3. Inspect the gear housing for cracks or distortion. Replace a cracked or distorted housing.

4. Check all shafts, bushings, and gears for scored surfaces. Replace defective parts and add new grease to the housing and gears.

ALL HEADLIGHTS DO NOT LIGHT	1. Loose battery cable. 2. Loose quick disconnect or broken wire from the battery to the headlight switch. 3. Defective headlight switch. 4. Disconnected or broken wire from the headlight switch to the beam selector switch.	5. Loose or broken wire to the bulbs. 6. Defective beam selector switch. 7. All headlight bulbs burned out. This may be caused by a defective or improperly adjusted alternator voltage regulator (Group 13).
INDIVIDUAL LIGHTS DO NOT LIGHT	1. Burned out bulb. 2. Loose or broken wires to the bulb.	3. Poor ground.
LIGHTS BURN OUT REPEATEDLY	1. Loose or corroded electrical connections. 2. Excessive vibration.	3. Improperly adjusted or defective alternator voltage regulator (Group 13).

FIG. 4—Light Trouble Diagnosis Guide

OIL PRESSURE INDICATOR LIGHT INOPERATIVE	1. Indicator bulb burned out. 2. Loose or broken wire from the light to the indicator switch. 3. Defective oil pressure sender unit (in this part).
CHARGE INDICATOR LIGHT INOPERATIVE	1. Burned out bulb. 2. Loose or broken wires. 3. Defective alternator regulator.
CHARGE INDICATOR LIGHT STAYS ON AT IDLE	1. Loose or broken drive belt. 2. Parallel resistance wire (15-ohm) burned out. 3. Loose connections or broken wires. 4. Regulator out of adjustment. 5. Grounded wiring from alternator to regulator. 6. Defective alternator.
OIL PRESSURE INDICATOR GAUGE INOPERATIVE	1. Loose or broken wire from the constant voltage regulator to the oil pressure gauge. 2. Grounded or broken wire from the engine oil pressure sending unit. 3. Defective gauge. 4. Defective oil pressure sending unit.
AMMETER GAUGE INOPERATIVE	1. Defective gauge (in this part). 2. Loose or broken wires. 3. Charging system malfunction.
FUEL GAUGE ERRATIC OR INOPERATIVE	1. Loose or broken wire from the constant voltage regulator to the fuel gauge. 2. Defective fuel gauge. 3. Loose, broken, or shorted wire from fuel gauge to the fuel tank sending unit. 4. Defective constant voltage regulator. 5. Defective fuel tank sending unit. 6. Poor ground between fuel tank and body.
TEMPERATURE GAUGE ERRATIC OR INOPERATIVE	1. Loose or broken wire from constant voltage regulator to the temperature gauge. 2. Defective temperature gauge. 3. Loose or broken wire from the temperature sending unit to the temperature gauge. 4. Defective temperature sending unit. 5. Defective constant voltage regulator.
FUEL, TEMPERATURE, AND OIL PRESSURE GAUGES ERRATIC	1. Loose or corroded constant voltage regulator ground. 2. Defective constant voltage regulator. 3. Broken or loose wire from or to the constant voltage regulator. 4. Defective ignition switch.

FIG. 5—Instrument Trouble Diagnosis Guide

HORNS DO NOT SOUND	1. Loose connections at horn button contact. 2. Open wire (yellow-green stripe) from horn to horn button. 3. Open wire (yellow) from headlight switch to horn button. 4. Horns defective or out of adjustment. 5. Defective circuit breaker in headlight switch.
ONE HORN FAILS TO OPERATE	1. Broken or loose wire to the horn (black wire). 2. Horn defective or out of adjustment.
HORNS OPERATE CONTINUOUSLY	1. Horn button defective.

FIG. 6—Horn Trouble Diagnosis Guide

OUTSIDE TURN SIGNAL LIGHTS INOPERATIVE	1. Burned out bulbs, or loose socket connections. 2. Open connection at turn signal flasher. 3. Loose or broken wire from ignition switch to flasher.	4. Defective flasher. 5. Loose or broken wire from flasher to turn signal switch. 6. Defective turn signal switch. 7. Broken, shorted, or loose wires from switch to lights.
INSTRUMENT PANEL TURN SIGNAL LIGHTS OPERATE INCORRECTLY	1. Burned out bulb, or improper connection at socket. 2. Loose, broken, or shorted wires	from switch to lights. 3. Inoperative outside turn signal lights (See above).
TURN SIGNAL CANCELS IMPROPERLY	1. Cam improperly positioned on steering wheel hub.	2. Coil spring on switch plate assembly loose or weak.

FIG. 7—Standard Turn Signal Trouble Diagnosis Guide

ALL TURN SIGNALS INOPERATIVE	1. Defective fuse. 2. Open circuit between fuse panel and turn signal switch. 3. Poor ground for turn signal relay and sequential flasher in luggage compartment. 4. Defective turn signal switch. 5. Open circuit between turn signal relay (dash panel) and turn signal switch.	6. Open circuit in turn signal relay (dash panel). 7. No electrical feed (open wire) between the turn signal relay (instrument panel) and the sequential flasher in the luggage compartment. 8. Defective sequential turn signal flasher assembly (luggage compartment).
LEFT OR RIGHT FRONT TURN SIGNAL DOES NOT OPERATE (TURN INDICATOR LIGHT REMAINS ON AND REAR LIGHTS OPERATE)	1. Turn signal filament of bulb burned out. 2. Corrosion or foreign matter on bulb or socket terminal. 3. Open circuit between the bulb	and the turn signal relay. 4. Defective turn signal relay or wiring in the luggage compartment. 5. Loose connectors in wiring from luggage compartment to bulb(s).
REAR TURN SIGNALS INOPERATIVE—ONE SIDE, BOTH SIDES, OR INDIVIDUAL BULBS (FRONT LIGHTS FLASH CORRECTLY)	1. Turn signal filament of bulb burned out. 2. Open circuits in rear turn signal wiring between turn signal relay in luggage compartment and turn signal bulbs.	3. Incorrect operation of the turn signal relay. 4. Open circuit between the sequential flasher assembly and the turn signal relay. 5. Defective sequential flasher assembly.

FIG. 8—Sequential Turn Signal Trouble Diagnosis Guide—External Signals

LEFT INDICATOR BULB FLASHES FOR RIGHT OR LEFT TURN, OR LEFT ONLY INDICATOR BULB FLASHES FOR EMERGENCY FLASHER	1. Open solenoid feed circuit between turn signal switch and the turn signal indicator relay (4 wire). 2. Wire No. 50 (green-white stripe) and wire No. 49 (white-blue stripe), are reversed in connector to turn signal indicator relay (4 wire). 3. Defective turn signal indicator relay (4 wire).
BOTH INDICATOR BULBS FLASH IN EITHER DIRECTION	1. Open circuit between solenoid of emergency warning relay and the turn signal switch. 2. Defective emergency warning relay.
LEFT OR RIGHT INDICATOR BULB INOPERATIVE	1. Defective bulb. 2. Inadequate ground at bulb, socket. 3. Open feed circuit between turn signal indicator relay (4 wire), and bulb. 4. Defective turn signal indicator relay (4 wire).
BOTH INDICATOR BULBS WILL NOT LIGHT	1. Defective bulbs. 2. Open circuit between turn signal relay (3 wire), and the turn signal indicator relay (4 wire). 3. Open circuit between the turn signal indicator relay (4 wire), and the bulbs. 4. Defective turn signal relay (3 wire). 5. Defective turn signal indicator relay (4 wire).
ONE INDICATOR BULB LIGHTS STEADY, BUT DOES NOT FLASH	1. Defective turn signal bulb or bulbs in system.
BOTH INDICATOR BULBS LIGHT STEADY, BUT DO NOT FLASH	1. Defective turn signal indicator bulb or bulbs in system. 2. Defective turn signal relay (3 wire).

FIG. 9—Sequential Turn Signal Trouble Diagnosis Guide—Instrument Panel Bulbs

INOPERATIVE OR SLOW WIPER	1. Binding linkage. 2. Defective switch. 3. Defective wiper motor(s). 4. Defective wiring or circuit breaker.
CONTINUOUS WIPER ACTION WITH SELECTOR AT INTERMITTENT POSITION—COMET	1. Loose, broken, or plugged vacuum hose from engine to control to governor. 2. Ruptured governor or governor switch diaphragm. 3. Defective control selector switch.
EXCESSIVE DWELL TIME DURING INTERMITTENT OPERATION—COMET	1. Pinched hose from lower governor fitting to control switch rear fitting. 2. Plugged orifice in control selector dwell regulator.

FIG. 10— Windshield Wiper Trouble Diagnosis Guide

WASHER DOES NOT OPERATE WHEN PEDAL IS ACTUATED	1. Clogged windshield jets. 2. Clogged hoses from fluid bag to pump and to windshield jets. 3. Possible cracks in pump bellows.
WASHER OPERATES BUT WIPERS DO NOT	1. Defective electrical switch assembly at the foot pedal. 2. Open circuit between foot pedal switch and wiper motor. 3. Defective windshield wiper switch. 4. Open circuit between windshield wiper switch and wiper motor. 5. Defective wiper motor.

FIG. 11—Foot-Pedal Windshield Washer System—Diagnosis Guide

INOPERATIVE WINDSHIELD WASHER PUMP	1. No fluid in washer reservoir or lines. 2. Broken or clogged water lines. 3. Open circuit between switch and pump. 4. Open circuit between washer pump and wiper motor. 5. Defective wiper switch. 6. Defective washer pump. 7. Defective switch on wiper motor. 8. Burned, corroded, or damaged switch plate in wiper motor. 9. Defective wiper motor.

FIG. 12—Electric Windshield Washer Pump—Diagnosis Guide

PART 15-2 — *Lighting System and Horns*

1 DESCRIPTION AND OPERATION

Refer to Wiring Diagram Manual Form 7795P-67 for locations of wiring harnesses. Schematics are shown in Group 19 of this manual.

HEADLIGHTS

The Falcon and Mustang use two No. 2 type sealed-beam headlights. Each light has low-beam and high-beam filaments.

The Comet and Fairlane use four sealed-beam headlights. The No. 1

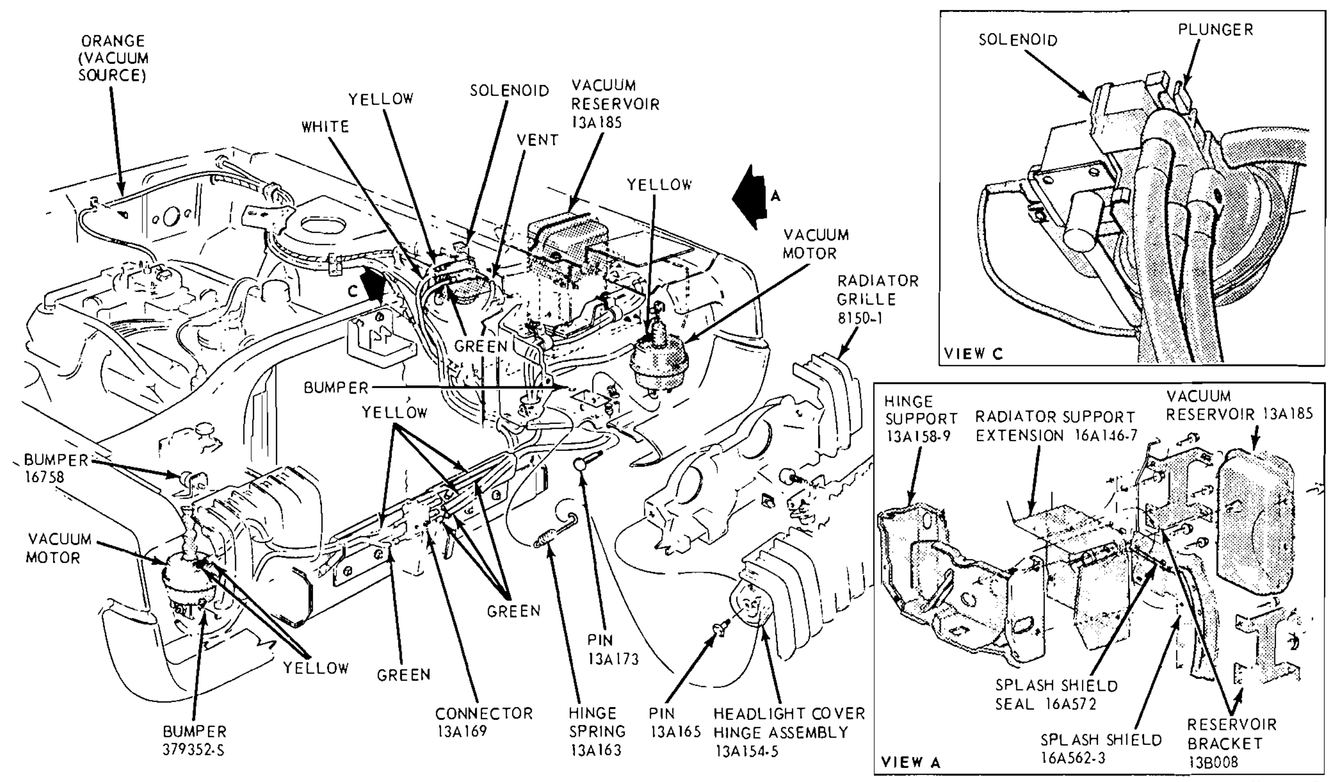


FIG. 1—Cougar Headlight Cover Installation

light is in the lower position and the No. 2 light is in the upper position.

The Cougar uses four sealed-beam headlights. The No. 1 light is in the inner position and the No. 2 light is in the outer position.

A conventional beam selector switch is located on the floorboard at the left of the driver.

Quick disconnect terminals are also provided at the left and right of the radiator support assembly. The terminals are color coded. Like colored terminals are connected together.

HEADLIGHT COVERS —COUGAR

The headlight covers are opened and closed by the use of vacuum motors. Refer to Fig. 1 for location of the headlight cover operating components and installation. Note the vacuum hose routing, connections and color codes.

The headlight switch, when pulled full out, connects the headlight circuit to a solenoid. The solenoid operates vacuum ports in a distribution valve which applies vacuum to the cover operating vacuum motors. The solenoid also opens a vacuum relief (exhaust) port to that side of the vacuum motor diaphragm to which vacuum is not applied. The vacuum exhaust port is vented through a tube into the passenger compartment in order to prevent engine oil fumes from entering the distribution valve.

Two cover hinge springs, attached to each cover, function as over-center type springs, which help hold the covers in the open or closed position. Vacuum applied to either side of the vacuum motor diaphragm during opening or closing, overcomes this spring tension.

Two reserve vacuum reservoirs provide vacuum storage which permits limited cycling of the headlight covers without the car engine running.

In case of vacuum loss or solenoid failure, the covers can be opened or closed manually as follows: To open or close the covers, push in the plunger located on the vacuum distribution valve (View C, Fig. 1), located behind the left headlights in the engine compartment; then, if the covers do not open, open them by hand while the plunger is in the in position. To reset the system for automatic operation, press inward on the end of the plunger so that the plunger return spring returns the plunger to the out position.

The headlight covers should be open (raised) when washing the car to clean the headlights for safer night-time driving.

HORNS

A pair of tuned horns are used. The horn button closes the circuit to the horns. One of the horns has a high-pitched tone; the other has a low-pitched tone.

2 IN-VEHICLE ADJUSTMENTS AND REPAIRS

HEADLIGHT ALIGNMENT

All headlight adjustments should be made with a half-full tank plus or minus one gallon, with a person seated in the driver's seat and a person seated in the passenger seat, the car unloaded and the trunk empty except for the spare tire and jacking equipment, and recommended pressure in all tires. Before each adjustment, bounce the car by pushing on the center of both the front and rear bumpers, to level the car.

To align the No. 1 headlights by means of a wall screen, select a level portion of the shop floor. Lay out the floor and wall as shown in Fig. 2.

Establish the headlight horizontal centerline by subtracting 20 inches from the actual measured height of the headlight lens center from the floor and adding this difference to the 20-inch reference line obtained by sighting over the uprights to obtain dimension B (upper diagram Fig. 3). Draw a horizontal line 2 inches below, and parallel to the headlight horizontal centerline. Then draw the headlight vertical centerlines on the screen as measured on the vehicle (dimension A, upper diagram Fig. 3).

NO. 1 HEADLIGHT HIGH BEAM ADJUSTMENT

Adjust each No. 1 headlight beam as shown in Fig. 3 upper diagram. **Cover the No. 2 lights when making this adjustment.**

Some states may not approve of the 2-inch dimension for the No. 1 headlights. Check the applicable state law, as a 3-inch dimension may be required.

NO. 2 HEADLIGHT LOW BEAM ADJUSTMENT

To align the No. 2 headlights, a new wall chart is used. Dimension B for the No. 2 lights will be different than B for the No. 1 lights, but dimension A which is measured on the car will be the same as for the No. 1 lights. **Note that the line of adjustment of the No. 2 lights is the horizontal centerline of the No. 2 lights.** Turn the headlights to low beam and adjust each No. 2 light as shown in Fig. 3.

Each headlight can be adjusted by means of two screws located under the headlight trim ring. Always bring each beam into final position by turning the adjusting screws clockwise so that the headlights will be held against the tension springs when the operation is completed (Fig. 4).

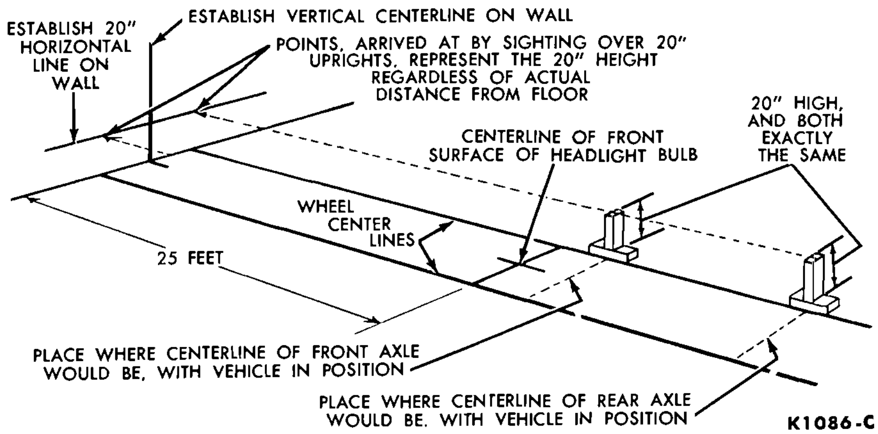


FIG. 2—Floor and Wall Layout

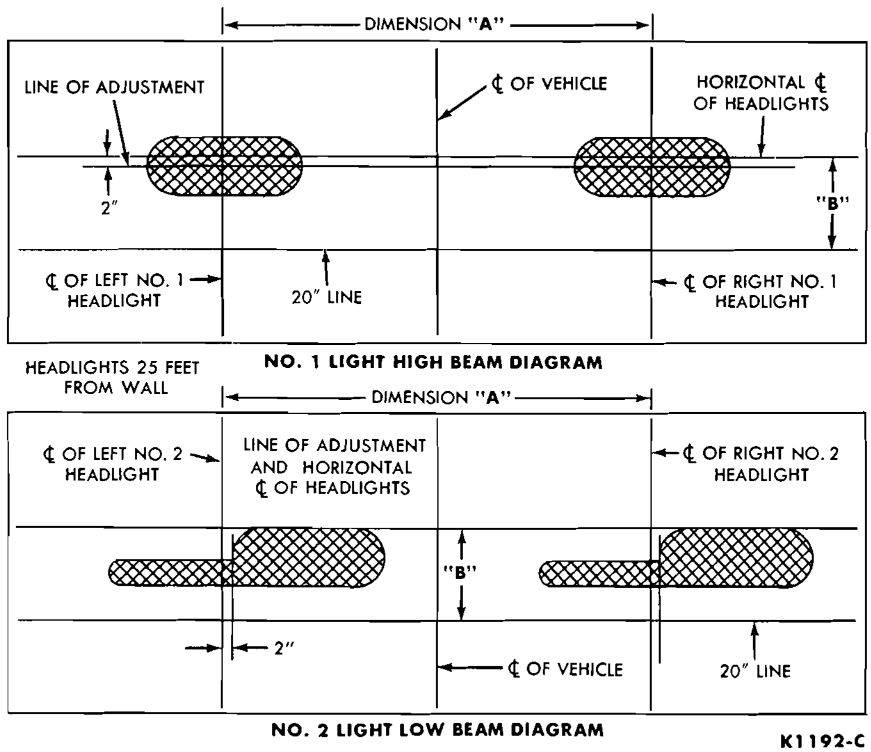


FIG. 3—Headlight Wall Screens

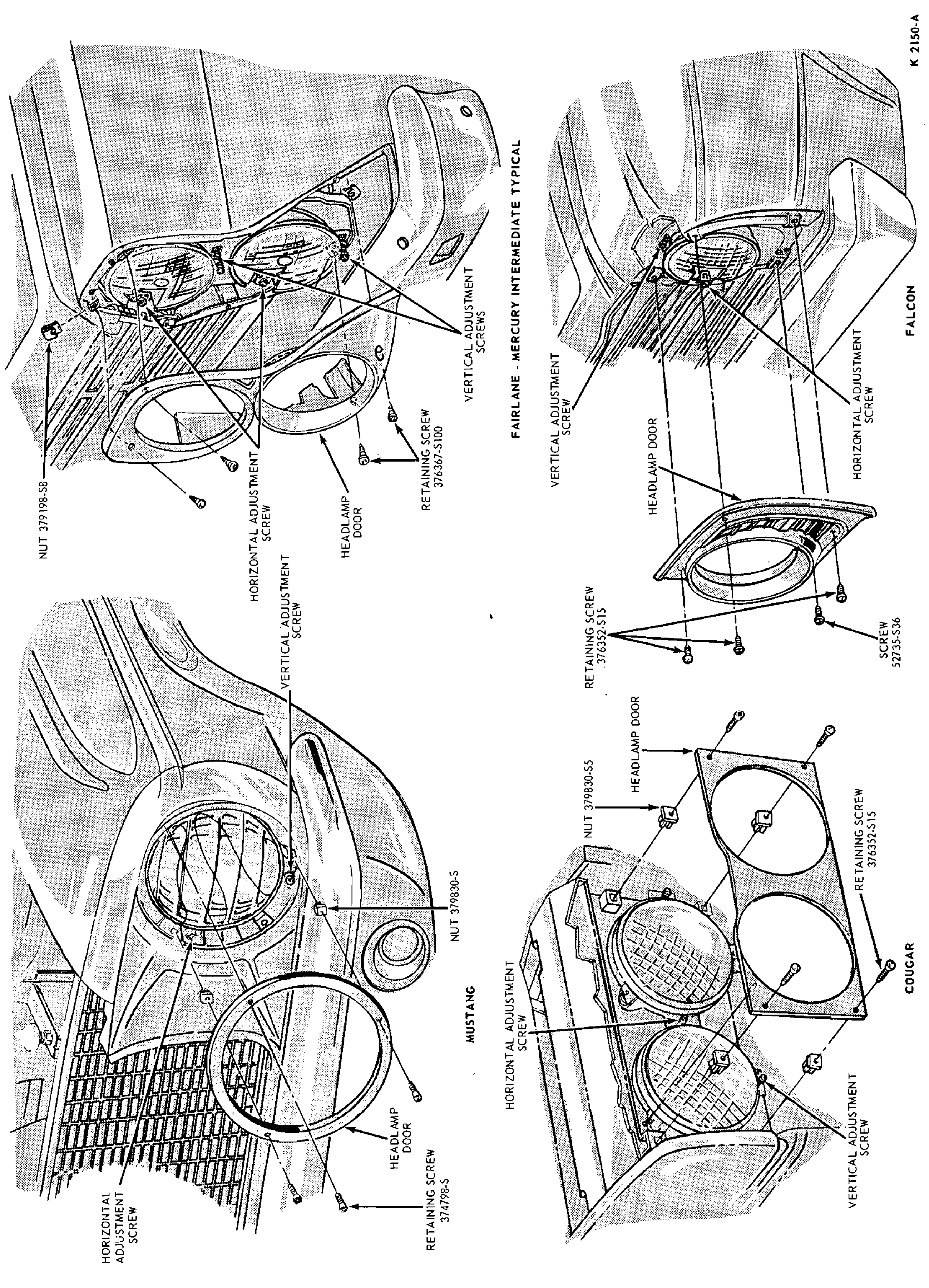


FIG. 4—Headlight Adjustment—All

3 REMOVAL AND INSTALLATION

HEADLIGHTS

On the Cougar it will be necessary to open the hood and release the vacuum valve (place the valve in manual position) and manually open the headlight cover.

1. Remove the screws and remove the headlight trim ring (Fig. 4).
2. Place a hand over the headlight assembly and unhook the spring from the retaining ring.
3. Remove the retaining ring by unhooking the ring from the clip located directly across the bulb from the spring hook.
4. Pull the headlight bulb forward and disconnect the wiring assembly plug.
5. Plug in the new bulb and place it in position, locating the bulb glass tabs in the positioning slots.
6. Hook the retaining ring over the clip, then over the bulb and secure it with the existing ball-ring spring.
7. Align the bulb with the wall screen.
8. Install the trim ring in position and install the retaining screws.

HEADLIGHT COVER VACUUM MOTOR—COUGAR

REMOVAL

Refer to Group 17 of this manual for illustration showing grille attaching parts.

1. Open the hood and remove the four screws which retain the center grille panel to the hood latch support brace.
2. Remove the headlight cover return springs.
3. Remove two capscrews which retain the grille center.
4. Remove two retaining screws from the grille outer end.
5. Remove the two stud nuts which retain the grille outer end.
6. Pull the grille assembly out from around the headlights.
7. Disconnect the vacuum motor lower vacuum hose from the vacuum motor. Remove the through bolt and nut from the bottom of the vacuum motor.
8. Disconnect the headlight wiring connectors from the headlights and lift out the vacuum motor assembly.

INSTALLATION

1. Position the vacuum motor assembly and, reaching under the car, install the retaining through bolt and nut. Connect the lower vacuum hose to the vacuum motor.
2. Connect the upper vacuum hose to the vacuum motor and connect the headlight wiring connector plug.
3. Position the grille in the grille opening and install the two retaining stud nuts.
4. Install the two grille top retaining screws and the two capscrews which retain the grille center.
5. Install the two headlight cover return springs.
6. Install the vacuum motor to headlight cover retaining clip.
7. Position the center grille panel to the grille and install the four center panel retaining capscrews.
8. Start the engine and check headlights and headlight covers for proper operation.

WIRING ASSEMBLY—DASH TO HEADLIGHT JUNCTION (14290 WIRING HARNESS) —FAIRLANE, FALCON, MERCURY INTERMEDIATE

1. Disconnect the battery ground cable from the battery.
2. Disconnect the harness plug connector at the dash panel.
3. Open the wiring retainer along the left fender apron.
4. Disconnect the alternator wiring connector. Remove the ground wire retaining screw at the alternator regulator. Disconnect the left headlight and parking light wiring connectors.
5. Remove the wiring leads (black-yellow stripe and yellow wires) from the starting motor solenoid. Open the wiring retaining clips on the right fender apron. Disconnect the right headlight and the right parking light wiring connectors.
6. Open the wiring retaining clips across the top of the radiator support and work the harness out from right to left. Remove the harness out through the hole at the alternator regulator.
7. Position the new wiring assembly in the engine compartment, working from left to right through the routing hole in the left radiator side support near the alternator regulator.
8. Connect the wiring leads to the starting motor solenoid. Install the wiring in the retaining clips on the right fender apron. Connect the headlights, parking light and horn connectors. Position the wiring in the retaining clips across the radiator support.
9. Connect the left headlights, parking light and horn. Connect the alternator regulator wiring connector. Install the ground wire and radio suppressor ground wire retaining screw.
10. Place the wiring harness in the wiring retainers along the left fender apron and connect the wiring connector at the dash panel.
11. Connect the battery ground cable to the battery.
12. Check operation of the headlights, parking lights and horns.

WIRING ASSEMBLY—DASH TO HEADLIGHT JUNCTION—COUGAR AND MUSTANG

1. Disconnect the battery ground cable.
2. Disconnect two multiple connectors and one single connector under the instrument panel, push the grommet and connectors through the hole into the engine compartment.
3. Disconnect the dual brake warning connector at the brake differential valve.
4. Open the harness retaining clips, disconnect the wires from the starter relay, and disconnect the alternator wiring connector.
5. Disconnect the headlight and parking light connectors, the voltage regulator wires and radio suppressor, and the horn leads. On the Cougar disconnect the headlight housing vacuum solenoid wire.
6. Remove the screws retaining the headlight and regulator ground wires, open all harness retaining clips and remove the harness from the vehicle.
7. Route the new harness and close all the retaining clips.
8. Install the screws retaining the headlight and regulator ground wires.
9. Connect the horns, the starter, the alternator and the headlight and parking light wires.
10. Connect the voltage regulator, wire connector, radio suppressor and the dual brake warning connector. On the Cougar also connect the headlight vacuum solenoid wire.
11. Push the multiple connectors through the dash, seat the dash grommet and connect the multiple connectors at the instrument panel.
12. Connect the battery and check the operation of all connected parts.

PARKING LIGHT HOUSING—ALL

1. Open the hood and disconnect the connector between the radiator support and grille.

2. Remove the lead wires from the retaining clips and pull the wire down.

3. Remove the two screws or retaining nuts from the housing retainer and remove the lamp assembly and housing retainer from the bumper or stone deflector extension.

4. Remove the lens, gasket and bulb from the lamp housing.

5. Install the bulb, gasket and lens in the housing.

6. Position the housing and retainer to the bumper or stone deflector extension and install the retaining screws or nuts.

7. Re-route the lead wires back to the connector at the radiator support and connect the connector.

8. Position the lead wire in the retaining clips as required.

PARKING LIGHT

To replace the bulb, remove the lens retaining screws and the lens.

HORNS

Disconnect the horn wire from the terminal. Remove the horn mounting bracket to horn retaining screws and remove the horn.

To install, mount the horn in position, then connect the horn wire to the horn terminal.

HORN BUTTON

1. Disconnect the horn wire connector, that has a yellow and a yellow-green wire in it, under the instrument panel, to the left of the steering column.

2. Press down evenly on the horn button and turn counter-clockwise until it lifts out from the steering wheel.

3. Remove the horn button and spring.

4. The horn button contacts are integral with the turn signal switch and are removed with the switch.

5. Install the horn button spring and button.

6. Connect the horn wire connector under the instrument panel.

DOME AND COURTESY LIGHT (S)

On the Mustang Hardtop, the dome light bulb can be removed by removing the screws retaining the dome light lens. To replace the dome light bulb in the Falcon, Fairlane and Mercury Intermediate it is only necessary to snap out the dome light lens.

To replace the courtesy light bulb for Mustangs (except Hardtops) pry the light assembly out of the lower rear quarter panel. On the Cougar the courtesy light is located in the upper rear quarter panel and the bulb can be replaced by snapping out the light assembly lens.

INSTRUMENT LIGHTS

The instrument cluster bulbs are retained in plug-in type sockets. The instrument cluster light bulbs can be replaced by pulling out the individual light sockets from the rear of the instrument cluster.

On the Mustang and Cougar, bulbs on the right side of the cluster can be replaced by reaching under the instrument panel. Bulbs on the left side of the cluster are replaced by removing the four heater control retaining screws and positioning the heater control outward to provide access.

WARNING LIGHT BULBS ROOF CONSOLE—XR-7 COUGAR

1. Remove two console retaining screws.

2. Pry the console downward to free the console retaining clips (two) from the roof.

3. Replace either of the four bulbs (seat belt, door, parking brake or low fuel) as required.

4. Snap the console into place and install the two retaining screws.

TRANSMISSION CONTROL SELECTOR LIGHT (ON STEERING COLUMN)—FALCON, FAIRLANE AND MERCURY INTERMEDIATE

1. Disconnect the battery ground cable from the battery.

2. Remove the horn ring and steering wheel.

3. Remove the light bulb socket retaining screw and pull out the bulb and socket assembly. Replace the bulb.

4. Position the bulb and socket assembly and install the socket retaining screw.

5. Install the steering wheel and horn ring.

6. Connect the battery ground cable to the battery.

TRANSMISSION CONTROL SELECTOR LIGHT—MUSTANG AND COUGAR

1. Remove the four retaining screws from the selector lever cover and dial indicator on the floor.

2. Lift the lever cover assembly and replace the bulb.

3. Position the cover to the floor and install the four cover retaining screws.

TRANSMISSION CONTROL SELECTOR LIGHT (ON CONSOLE)—MUSTANG AND COUGAR

1. Pry the top finish pad cover from the console.

2. Remove the two retaining screws from inside the glove box and remove the upper finish panel.

3. Position the selector lever in the one position and remove the light socket and bulb from its retainer.

4. Replace the bulb and install the socket in the retainer.

5. Position the finish panel and install the retaining screws.

6. Snap the finish pad cover into position.

TAILLIGHT LENS—COUGAR

1. Remove the luggage compartment rear trim panel.

2. Remove the four bulb and socket assemblies from the light body.

3. Remove the six nuts retaining the light assembly to the body back panel.

4. Remove the light assembly and place it on a work bench.

5. Remove ten nuts and remove the lens and door from the light body. Remove the lens from the door.

6. Position the new lens in the door.

7. Position the lens and door assembly to the light body and install the ten retaining screws.

8. Position the light assembly to the car body and install the six light assembly retaining nuts.

9. Plug in the light socket and bulbs.

10. Install the luggage compartment rear trim panel.

TAILLIGHT LENS—MUSTANG

1. Open the rear deck and remove the spare tire.

2. Remove the bulb socket from the rear light body.

3. Remove the six plastic covers from the ends of the bezel assembly studs and also remove the six retaining nuts.

4. Pull the light body and lens from the studs and remove the assembly from the vehicle.

5. Remove the six retaining screws from the lens and remove the lens from the body.

6. Position the lens to the light body and install the six retaining screws.
7. Position the light body assembly to the bezel studs and install the six retaining nuts. Install the plastic covers on the ends of the studs.
8. Plug the bulb and socket assembly into the light body.
9. Replace the spare tire and close the rear deck lid.

TAILLIGHT LENS AND/OR BULB—FALCON, MERCURY INTERMEDIATE—MODEL 71

1. Remove four screws retaining the lamp assembly to the quarter panel.
2. Remove the lens from the lamp assembly. Remove bulb if necessary.
3. Position the lens to the lamp assembly.
4. Position the lamp assembly to the quarter panel and install the retaining screws.

TAIL AND STOP LIGHT BULBS—EXCEPT STATION WAGONS

The tail and stoplight bulbs may be replaced, by opening the rear deck lid and pulling the socket and bulb assembly from the rear lamp body. On the Cougar, it will be necessary to remove the luggage compartment liner in order to remove light sockets.

TAILLIGHT BODY—COUGAR

1. Remove the luggage compartment rear trim panel.
2. Remove the four bulb and socket assemblies from the light body.
3. Remove the six nuts retaining the light assembly to the body back panel and remove the assembly.
4. Remove the outer seal from the light body and also remove the four rubber ring gaskets from the bulb openings.
5. Remove the ten retaining nuts and remove the lens and door assembly from the light body.
6. If replacement of the light body is necessary transfer the six studs to the new light body.
7. Cement the lens seal to the light body.
8. Position the lens and door assembly to the light body and install the ten retaining nuts.
9. Install the rubber ring gaskets in the bulb openings. Cement the outer seal to the light body.
10. Position the light assembly to the car body and install the six light assembly retaining nuts.
11. Plug in the light socket and bulbs.
12. Install the luggage compartment rear trim panel. Check the operation of the lights.

TAILLIGHT BODY—FALCON

1. Open the rear deck lid. Disconnect the bulb and socket from the back of the taillight housing.
2. Remove the four light body retaining screws and remove the light body from the quarter panel.
3. Separate the gasket and lens from the light body.
4. Cement the gasket to the light body. Position the lens to the light body and position the light body to the quarter panel and install the four retaining screws.
5. Connect the socket and bulb to the light housing.
6. Close the rear deck and check the operation of the light.

TAILLIGHT BODY, LENS AND/ OR BULBS—FAIRLANE MODEL 71

1. Remove the four door retaining screws and remove the door.
2. Remove the four screws retaining the light assembly to the quarter panel. Remove the bulb socket from the light assembly and remove the light assembly.
3. Remove the light body gasket.
4. Remove the six lens retaining screws and remove the lens from the light body.
5. Remove four screws and two back-up light lens retainers and gaskets from the taillight lens.
6. Position the gaskets and back-up lens to the rear light lens. Position the retainers and install the four lens retaining screws.
7. Install a new lens in the light body and install the six lens retaining screws.
8. Position the light body gasket. Position the light body to the quarter panel, insert the light bulb and socket assemblies into the light body and install the four light body retaining screws.
9. Position the rear light door to the light body and install the four retaining screws.

TAILLIGHT BODY—MUSTANG

1. Remove the spare wheel and tire assembly.
2. Unplug the bulb and socket from the light body.
3. Remove the six plastic covers from the light body and bezel (doors) retaining studs.
4. Remove the six nuts from the light body and bezel (doors) retaining studs.
5. Pull the light body back and off the studs. The light bezels (doors) can be replaced if necessary at this time as the studs are on the bezel and these studs and nuts retain the light assembly to the body panel.
6. Remove the gasket seal from the front of the lens.
7. Remove the six lens retaining screws from the light body and remove the lens from the light body.
8. Install a new gasket in the light body. Position the lens to the body and install the six lens retaining screws.
9. If the bezels (doors) were removed, position the bezels to the body panel, using new seals.
10. Position the seal to the lens and light body assembly.
11. Position the light body assembly on the retaining studs and install the six retaining nuts. Install the six plastic stud covers.
12. Plug the bulb and socket assembly into the light body.

BACKUP LIGHT BODY—COUGAR AND MUSTANG

1. Open the luggage compartment and remove the luggage compartment rear trim panel (Cougar only).
2. Fold back the carpet and remove the cover over the quarter panel.
3. Disconnect the backup light connector, push the grommet through the side of the inner panel, and pull the lead through the hole.
4. Remove the nuts and retainer and remove the backup light from the lower body panel extension.
5. Transfer the lens, bulb and gasket to the new light body, and install sealer to the new light.
6. Position the light assembly to the lower body panel extension, position the retainer, and install the mounting nuts.
7. Route the lead through the hole and push the grommet into place.
8. Connect the backup light connector, check the operation of the light, install the quarter panel cover, and position the carpet.
9. Install the luggage compartment rear trim panel (Cougar only).

TAILLIGHT DOOR—FAIRLANE, ALL EXCEPT MODEL 71

1. From inside the luggage compartment, remove the bulb and socket and disconnect the two wiring connectors.
2. Remove the five light assembly

to quarter panel retaining nuts and remove the light assembly.

3. Remove one nut and one screw. Disconnect the back-up light bulb and remove the light body from the door and lens assembly.

4. Remove four screws retaining the backup light lens and taillight lens to the door with the retainer. Remove both lenses.

5. Position the taillight lens and backup lens to the door. Install the four retaining screws.

6. Position the light body to the door. Plug in the backup light bulb and install the one nut and screw.

7. Position the light assembly to the quarter panel and install the five retaining nuts.

8. Plug the taillight bulb and socket assembly into the light body and connect the two wiring connectors.

TAILLIGHT DOOR—COUGAR

1. Remove the luggage compartment rear trim panel.

2. Remove the four bulb and socket assemblies from the light body.

3. Remove the six nuts retaining the light assembly to the body back panel.

4. Remove the light assembly and place it on a work bench.

5. Remove ten nuts and remove the lens and door from the light body. Remove the lens from the door.

6. Position the lens in the door.

7. Position the lens and door assembly to the light body and install the ten retaining screws.

8. Position the light assembly to the car body and install the six light assembly retaining nuts.

9. Plug in the light socket and bulbs.

10. Install the luggage compartment rear trim panel.

TAILLIGHT DOOR—MUSTANG

1. Open the rear deck and remove the spare tire.

2. Unplug the bulb and socket from the light body.

3. Remove the six plastic covers from the light body and bezel (door) retaining studs.

4. Remove the six nuts from the light body and bezel (doors) retaining studs and pull the light body from the studs.

5. Remove the three door assemblies from the back panel and remove the seals from the doors.

6. Install the three rubber seals on the door assemblies and install the door assemblies to the back panel.

7. Position the light body to the retaining studs and install the six retaining nuts.

8. Install the six plastic stud covers.

9. Plug the bulb and socket assembly into the light body.

10. Install the spare tire, and check the operation of the lights.

LICENSE PLATE LIGHT ASSEMBLY—EXCEPT COUGAR AND STATION WAGONS

1. Open the rear deck lid and disconnect the license plate light lead wire and feed the wire through the rear panel.

2. Remove the two screws attaching the light assembly to the bumper and remove the assembly.

3. Remove the lens bezel, lens and gasket retaining screw and remove the bulb from the assembly.

4. Install the bulb in the assembly. Position the gasket, lens and lens bezel to the assembly and install the retaining screw.

5. Position the light assembly to the bumper and install the two retaining screws.

6. Feed the lead wire thru the rear panel and connect the connector.

LICENSE PLATE BULB AND/OR LENS

On all vehicles except the Cougar and station wagon, the license plate bulb or lens can be replaced by removing one screw that retains the lens, lens bezel and gasket to the light assembly.

On station wagons the bulb or lens may be replaced by prying the lens assembly from the bumper and then removing the bulb and socket assembly from the lens.

For the Cougar license plate light only, it is necessary to open the rear deck and remove the luggage compartment liner and then pull the light socket from the rear panel.

PART 15-3— *Switches, Circuit Breakers and Fuses*

1 DESCRIPTION AND OPERATION

Refer to Wiring Diagram Manual Form 7795P-67 for locations of wiring harnesses. Schematics are shown in Group 19 of this manual.

HEADLIGHT SWITCH

A combination headlight switch and two circuit breakers is used (Fig. 1). The headlight circuit is protected by an 18 ampere circuit breaker for the Mercury Intermediate and Fairlane, a 12 ampere circuit breaker for the Falcon and the Mustang. The tail, parking, license plate light and horn circuits are protected by a 15 ampere circuit breaker.

FUSE PANEL

The fuse panel for the Falcon, Fairlane and Mercury Intermediate is mounted on the dash panel above the headlight dimmer switch. On the Mustang and Cougar the fuse panel is mounted above the accelerator pedal. Figs. 2 through 6 show the fuse locations in the panel and their respective values.

MECHANICAL STOP LIGHT SWITCH

The mechanical stoplight switch

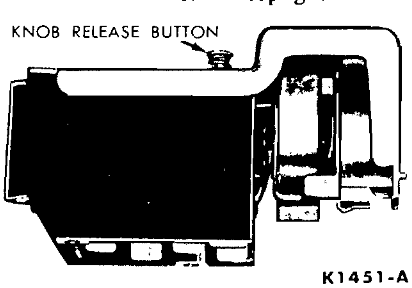


FIG. 1—Headlight Switch

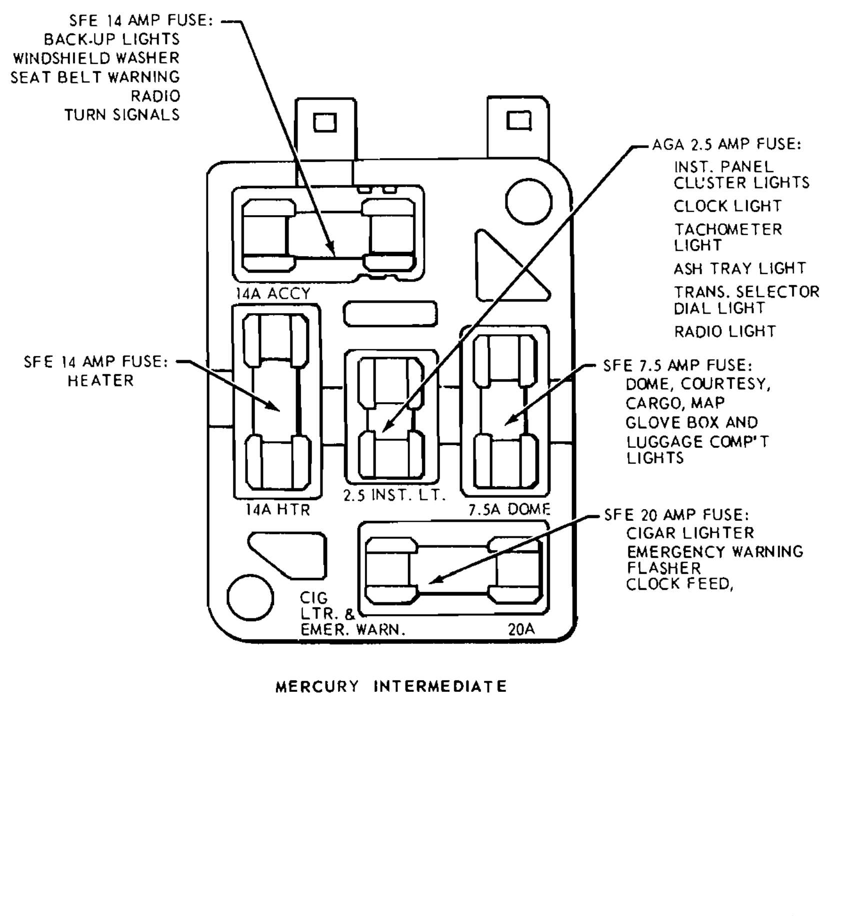


FIG. 2—Fuse Panel—Mercury Intermediate

differs from the hydraulic switch formerly used. The switch assembly is installed on the pin of the brake pedal arm so that it straddles the master cylinder push rod. The switch assembly is a slip fit on the pedal arm pin and thus the switch assembly moves with the pedal arm whenever the brake pedal is depressed.

The brake pedal arm pin has a designed-in clearance with the eye of the master cylinder push rod (Fig. 7). Because of this clearance, whenever the brake pedal is pushed forward, the stop light switch contacts, moving with the pedal arm, are actually pushed against the end of the master cylinder push rod, through the switch actuating pin. It is this movement of the switch with respect to the actuating pin and master cylinder push rod that closes the switch contacts completing the circuit to the stoplights.

When the brake pedal is released, the spring in the stop light switch returns the actuating pin to its normal position and the circuit to the stop lights opens.

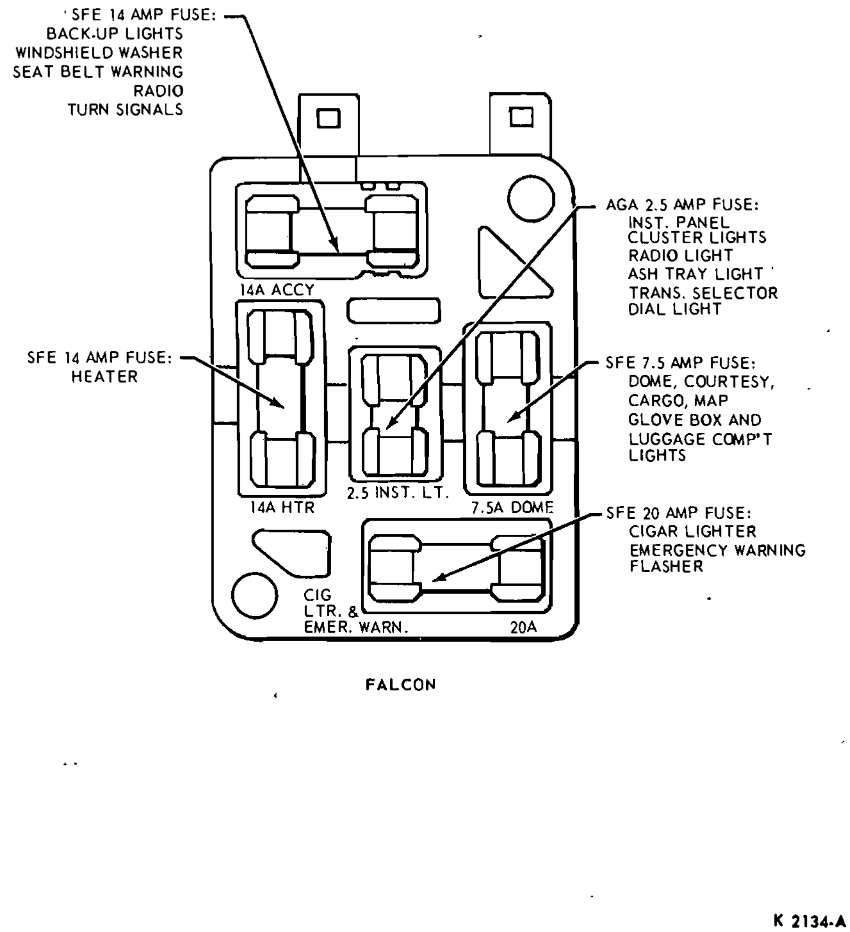


FIG. 3—Fuse Panel—Falcon

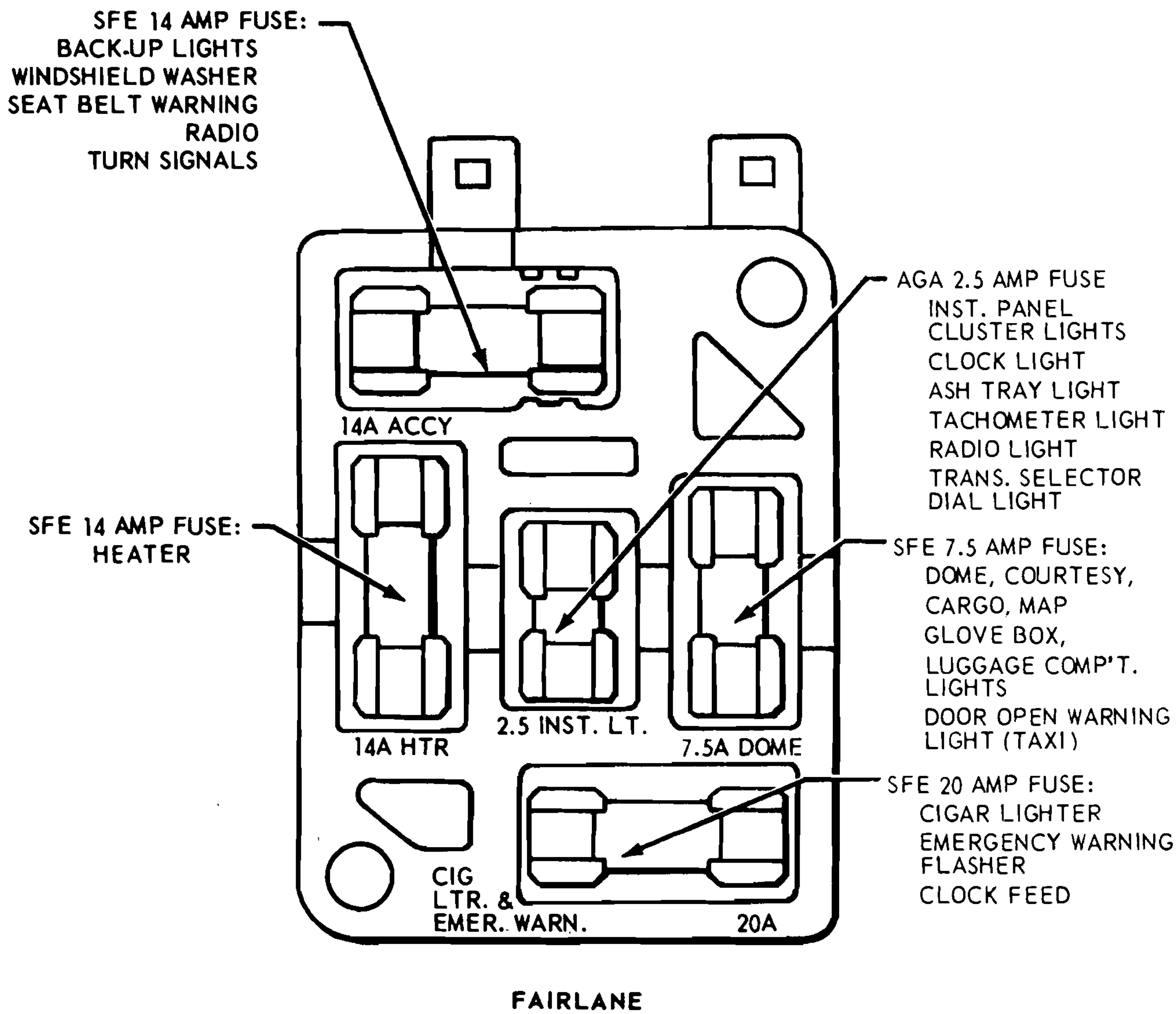
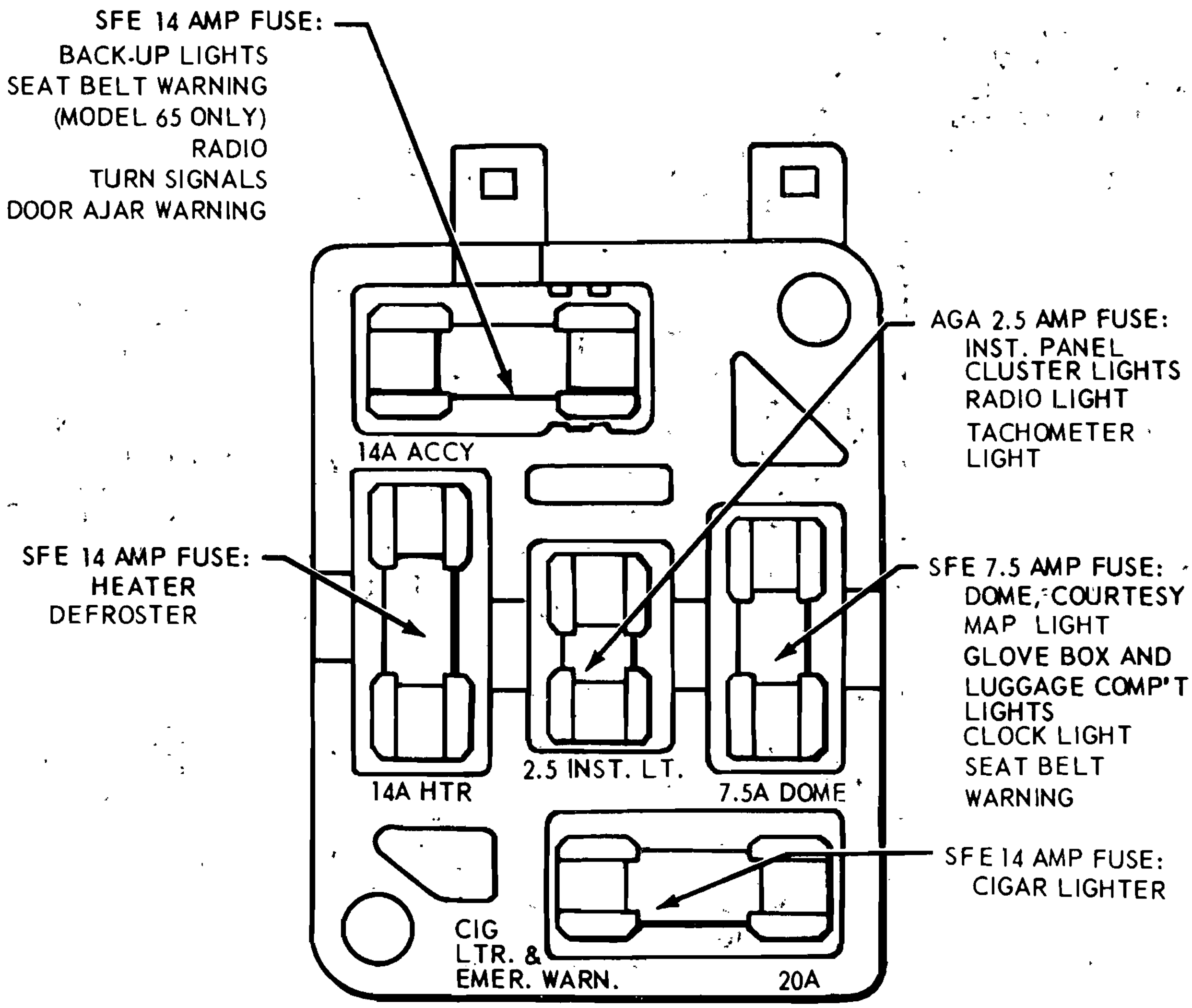
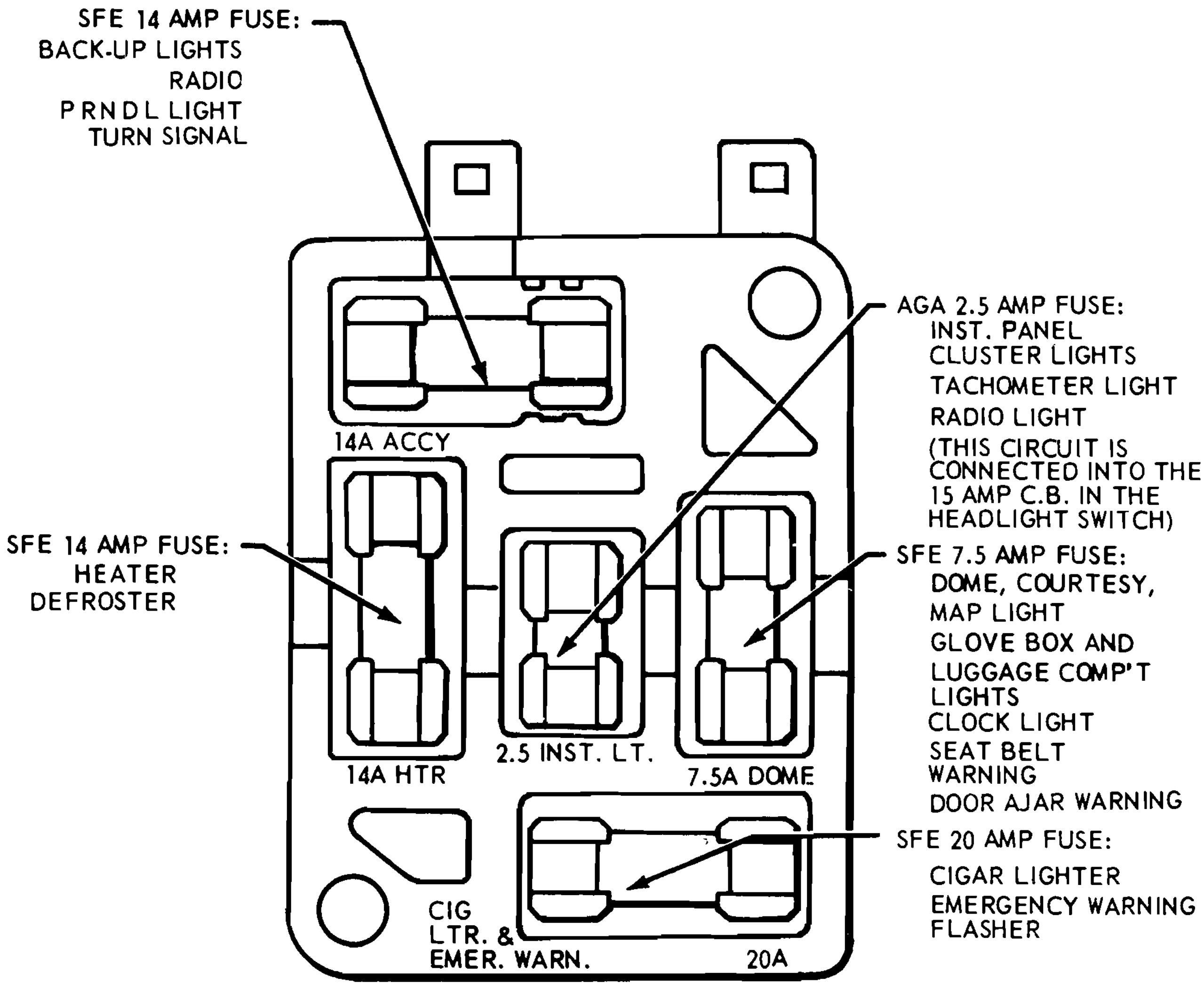


FIG. 4—Fuse Panel—Fairlane



COUGAR

FIG. 5—Fuse Panel—Cougar



MUSTANG

FIG. 6—Fuse Panel—Mustang

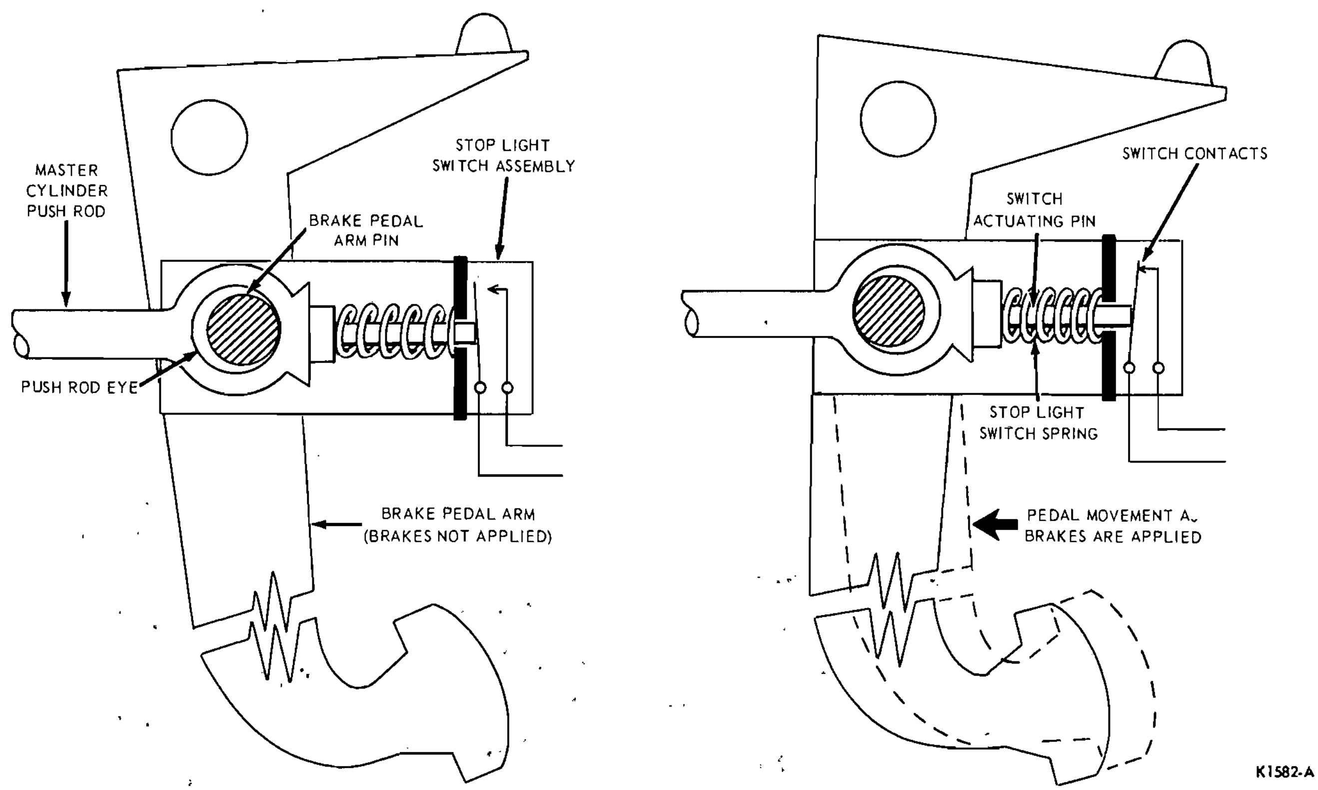


FIG. 7—Mechanical Stoplight Switch Operation

2 REMOVAL AND INSTALLATION

HEADLIGHT SWITCH—EXCEPT MUSTANG AND COUGAR

1. Disconnect the battery ground cable.

2. To remove the control knob and shaft assembly, place the knob in the full ON position. Then press the knob release button on the switch assembly (Fig. 1). Pull the knob and shaft out of the switch assembly.

3. Unscrew the mounting nut, remove the bezel and switch, then remove the junction block from the switch.

4. To install the switch, connect the junction block to the headlight switch, position the switch in the instrument panel, and install the bezel and mounting nut.

5. Install the knob and shaft assembly by inserting it all the way into the switch until a distinct click is heard. In some instances it may be necessary to rotate the shaft slightly until it engages the switch-contact carrier.

6. Connect the battery ground cable.

HEADLIGHT SWITCH—MUSTANG AND COUGAR

1. Disconnect the battery ground cable from the battery.

2. Remove two screws and lower the parking brake and air control.

3. To remove the control knob and shaft assembly, place the knob in the full ON position. Then press the knob release button on the switch assembly (Fig. 1). Pull the knob and shaft out of the switch assembly.

4. Remove the switch bezel retaining nut and the bezel, then lower the switch assembly. Disconnect the wiring junction block from the switch and remove the switch.

5. To install the switch, connect the junction block to the headlight switch, position the switch in the instrument panel, and install the bezel and the retaining nut.

6. Install the knob and shaft assembly by inserting it all the way into the switch until a distinct click is heard. In some instances it may be necessary to rotate the shaft slightly until it engages the switch-contact carrier.

7. Position the parking brake and air control and install the two retaining screws.

8. Connect the battery ground cable to the battery and check the switch operation.

IGNITION SWITCH—ALL MODELS

1. Disconnect the battery ground cable from the battery.

2. Insert the ignition key in the switch. Turn the switch to the accessory position. Insert a wire pin in the hole on the ignition switch. Slightly depress the pin while turning the key counterclockwise past the accessory position. This will release the lock cylinder from the switch assembly. Pull out the lock cylinder with the key. If only the lock cylinder is to be replaced, proceed to step 8.

3. Remove the bezel nut with tool T65L-700-A.

4. Lower the switch assembly from the instrument panel and remove the accessory wire retaining nut and remove the accessory and gauge feed wires from the switch.

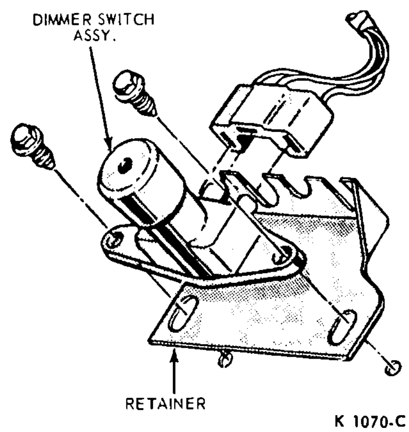


FIG. 8—Headlight Beam Selector Switch

5. Remove the insulated plug from the switch and remove the switch.
6. To install the switch, connect the insulated connector plug to the switch. Install the accessory wire and retaining nut to the stud on the back of the switch.
7. Position the switch in its retainer and install the bezel nut.
8. Insert the key in the switch assembly and turn the key to the accessory position. Place the cylinder and key in the switch. Push the cylinder into the switch until it is fully seated then turn the key to the lock position. Turn the key to check the lock cylinder operation.
9. Connect the battery ground cable to the battery and check the operation of the switch assembly.

HEADLIGHT BEAM SELECTOR SWITCH

Lay the floor mat back from the area of the switch, and remove the mounting screws (Fig. 8). Disconnect the wire terminal block from the switch.

To install the switch, connect the terminal block to the switch and install the switch to the floor. Replace the floor mat.

PARKING BRAKE WARNING SWITCH—COUGAR

1. Disconnect the lead wire to the switch.
2. Remove the nut and bolt retaining the switch assembly to the parking brake control assembly and remove the switch.
3. Position the parking brake in the OFF position, then position the switch to the lower end of the parking brake control rod and loosely install the retaining nut and bolt.
4. Connect the lead wire to the switch assembly.
5. With the parking brake in the OFF position, slide the switch up the brake control rod until the warning light goes out. Tighten the retaining nut and bolt to fasten the switch in position.
6. Check the operation of the parking brake and switch.

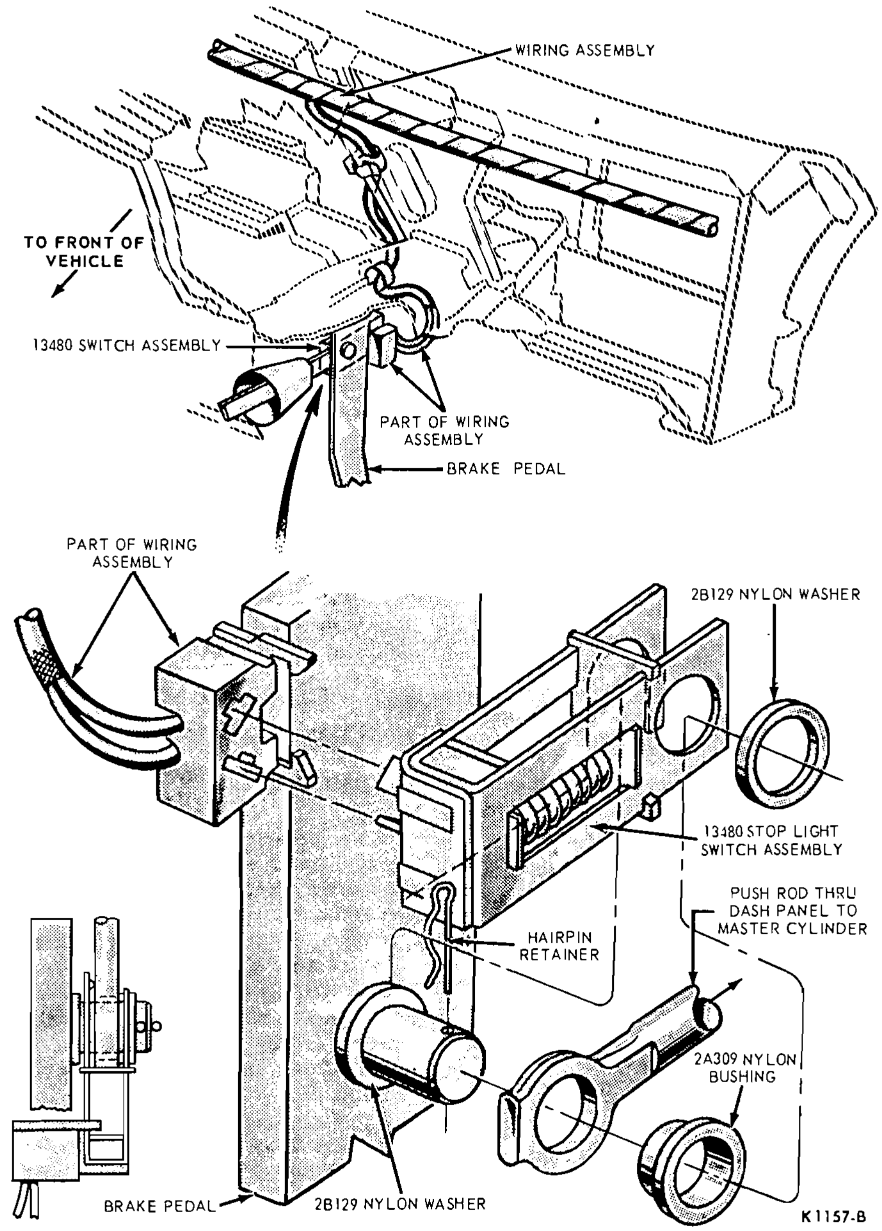


FIG. 9—Mechanical Stoplight Switch Assembly

STOP LIGHT SWITCH—ALL

1. Disconnect the wires at the connector.
2. Remove the hairpin retainer, slide the stop light switch, the push rod and the nylon washers and bushing away from the pedal, and remove the switch (Fig. 9).
3. Position the switch, push rod, and bushing and washers on the brake pedal pin, in the order shown in Fig. 9, and install the hairpin retainer.
4. Connect the wires at the connector, and install the wires in the retaining clip (Fig. 9).

DOME LIGHT SWITCH

The dome light switch is part of

the headlight switch. It is actuated by rotating the switch control knob to the maximum counterclockwise position. The dome light and headlight switch is replaced as a unit (Fig. 1).

DUAL BRAKE WARNING LIGHT SWITCH—ALL

1. Disconnect the brake warning light wire from the switch (mounted on the pressure differential valve assembly). **To prevent damage to the brake warning switch wire connector, expand the plastic lugs to allow removal of the shell-wire connector from the switch body.**
2. Remove the switch from the pressure differential valve.
3. Install the new switch in the pressure differential valve.
4. Connect the shell-wire connector to the brake warning light switch. **Make sure that the plastic lugs on the connector hold the connector securely to the switch.**

Refer to Group 2, Part 1, Brakes for centralizing differential valve procedures.

NEUTRAL START SWITCH

See Group 7 for replacement of the neutral start switch on cars equipped with automatic transmissions.

BACK-UP LIGHT SWITCH

On cars equipped with the steering column standard shift, the switch is located on the lower end of the steering column.

On cars equipped with a shift lever directly over either the standard or automatic transmission, the back-up light switch is located on the transmission.

INTERIOR LIGHT SWITCH (S)— COUGAR XR-7

1. Disconnect the battery ground cable.
2. Remove the instrument cluster assembly from the instrument panel.
3. Remove the nut(s) retaining the toggle switch(s) to the instrument panel. Pull the switch(s) to the cluster opening position the switch(s) to the the switch(s).
4. Connect the switch(s) to the lead wire(s) and working through the opening position the switch (s) to the instrument panel and install the retaining nut(s).
5. Install the instrument cluster in the instrument panel.
6. Connect the battery ground cable. Check the operation of the switch(s).

MAP LIGHT SWITCH— MUSTANG (ROOF CONSOLE)

1. Remove the four console-to-roof retaining screws (two screws at the front and two screws at the rear).
2. Remove the two switch-to-console retaining screws. Remove the ground wire retaining screw above the windshield. Disconnect the switch wiring connectors and remove the switch.
3. Position the new switch to the console and install the two switch-to-console retaining screws. Position the ground wire above the windshield and install the retaining screw. Connect the switch wiring connectors.
4. Position the console to the roof and install the four console-to-roof retaining screws.

TURN INDICATOR SWITCH AND WIRE ASSEMBLY

REMOVAL

The emergency warning flasher switch and the turn signal flasher switch are integral parts of the same switch assembly.

1. Disconnect the battery ground cable from the battery.
2. Remove the steering wheel hub.
3. Remove the horn button (three screws). The springs will fall out.
4. Remove the steering wheel retaining nut.
5. Using tool 3600-AA, remove the steering wheel.
6. Remove the turn signal switch lever. Remove the emergency flasher control knob. (Disconnect the set-speed switch wiring connector, if so equipped).
7. Remove two steering column upper collar retaining screws and remove the upper collar.
8. Disconnect the turn signal switch wiring multiple connector (near bottom of the steering column). It may be necessary to lower the hand brake control and left air vent control on some Mustang and Cougar models to provide access to the turn signal wiring connector.
9. Remove the wires and terminals from the connector blocks. This can be done by depressing the tab on the wire terminal with an awl or, with an empty ball point pen refill cartridge; then, pull the wire and terminal from the connector block. **Record the color code and location of each wire before removing it from the connector block.** Tape the wires together and attach a piece of heavy cord to the wires to help pull the wires through the steering column during installation.
10. Remove the plastic cover from over the wires.
11. Push the lower steering column collar down. Remove the wiring retaining clip.
12. Remove the two screws retaining the switch in the steering column and pull the switch and wiring assembly out of the column.

INSTALLATION

1. Tape the wiring of the replacement switch assembly together and transfer the pull cord used during removal.
2. Pull the wires down through the steering column with the cord, and position the switch to the steering column hub.
3. Install the two screws retaining the switch assembly to the steering column hub.
4. Install the wiring retaining clip on the steering column.
5. Install the plastic cover over the wires.
6. Press the switch wires into the connector blocks in their correct location recorded during removal. Plug the connector blocks together with the mating connector blocks at the dash panel.
7. Pull the steering column collar up and snap it in position.
8. Position the upper column and install the two retaining screws.
9. Install the emergency flasher retainer and knob.
10. Install the turn signal lever.
11. Position the steering wheel on the steering shaft and install the steering wheel retaining nut.
12. Install the horn button with its springs and the three retaining screws.
13. Install the hub.
14. Connect the battery ground cable to the battery.
15. Check the operation of the turn signal emergency flashers and horns.

WINDSHIELD WIPER/WASHER SWITCH—FAIRLANE

1. Disconnect battery ground cable from the battery.
2. Remove the wiper switch control knobs.
3. From the lower edge of the instrument cluster, remove the three screws which retain the switch assembly to the instrument panel. Disconnect the switch wiring connectors from the switch and remove the switch assembly.

4. Remove the retaining screw and plastic bar and separate the wiper and washer switch.
5. Replace the wiper or washer switch as required. Position the two switches together and install the plastic bar and retaining screw which holds the two switches together so that when the washer switch is turned on it also actuates the wiper switch.
6. Connect the wiring connectors to the switch assembly. Position the switch assembly to the instrument panel and install the three switch assembly retaining screws.
7. Install the control knobs.
8. Connect the battery ground cable to the battery.

WINDSHIELD WIPER/WASHER SWITCH—FALCON

REMOVAL

1. Disconnect the battery ground cable.
2. Remove the wiper/washer switch control knobs and unplug the connectors at the switch.
3. Remove the two switch retaining screws from the cluster and remove the switch from under the instrument panel.
4. Remove the two screws from the switch assembly and separate the washer switch from the wiper switch.

INSTALLATION

1. Position the switches together and install the two assembly retaining screws.
2. Position the switch to the back of the cluster and install the retaining screws.
3. Connect the switch connectors and install the control knobs.
4. Connect the battery ground cable and check the operation of the switch.

WINDSHIELD WIPER SWITCH—MERCURY INTERMEDIATE (STANDARD)

1. Disconnect the battery cable.
2. Remove the wiper switch knob, bezel nut, and bezel.
3. Pull out the switch from under the instrument panel. Disconnect the plug connector from the switch and remove the switch.
4. Position the switch and connect the plug connector.
5. Position the switch in the instrument panel and install the bezel, bezel nut, and knob.
6. Connect the battery cable and check the operation of the switch.

WINDSHIELD WIPER SWITCH—MERCURY INTERMEDIATE (INTERMITTENT WIPERS)

1. Disconnect the battery ground cable from the battery.
2. Loosen the wiper control knob set screws and remove the knob.
3. Remove the bezel nut and the bezel.
4. Lower the switch assembly. Remove the three vacuum hoses from the switch. Disconnect the wiring connector (plug-in type) from the switch and remove the switch assembly.
5. Plug the wiring connector into the switch. Using the color code provided on the switch and hoses, connect the vacuum hoses to the switch and position the switch assembly to the instrument panel.
6. Install the bezel, the bezel nut and the switch knob.
7. Connect the battery ground cable to the battery.

WINDSHIELD WIPER SWITCH—MUSTANG AND COUGAR

1. Disconnect the battery ground cable from the battery.
2. Remove the instrument cluster assembly. Remove the wire harness plug from the switch.
3. Remove the two screws retaining the wiper switch to the instrument cluster and remove the switch.
4. Position the new switch to the instrument cluster and install the two switch retaining screws. Plug the wire harness into the switch. Be sure that all terminals are properly engaged.
5. Install the instrument cluster.
6. Connect the battery ground cable to the battery and check the operation of instruments and controls. Make sure that the windshield wiper motor operates on both speeds and parks properly.

PART 15-4— *Instruments*

1 DIAGNOSIS AND TESTING

SPEEDOMETER DIAGNOSTIC PROCEDURES

Speedometer system complaints are generally the result of a visible or audible defect in the system. It is imperative that the specific defect be determined prior to attempting any physical repairs to preclude unnecessarily disassembling system components. The following suggestions are intended to aid in quick and accurate system problem diagnosis.

VISIBLE DEFECTS

Slight Needle Waver or Severe Needle Fluctuation (No Noise)

1. Loose cable nut.
2. Defective speedometer head.
3. Bent cable core at attaching nut.
4. Kinked or pinched cable housing.
5. Excessive grease in speedometer head.
6. Defective speed control regulator.

Inoperative

1. Broken cable core.
2. Defective drive and/or driven gear.
3. Defective speedometer head.

AUDIBLE DEFECTS

Clicking or Ticking (With Needle Waver), Grinding or Ringing

1. Loose cable nut.
2. Defective drive and/or driven gear.
3. Defective speedometer head.
4. No lube on cable.

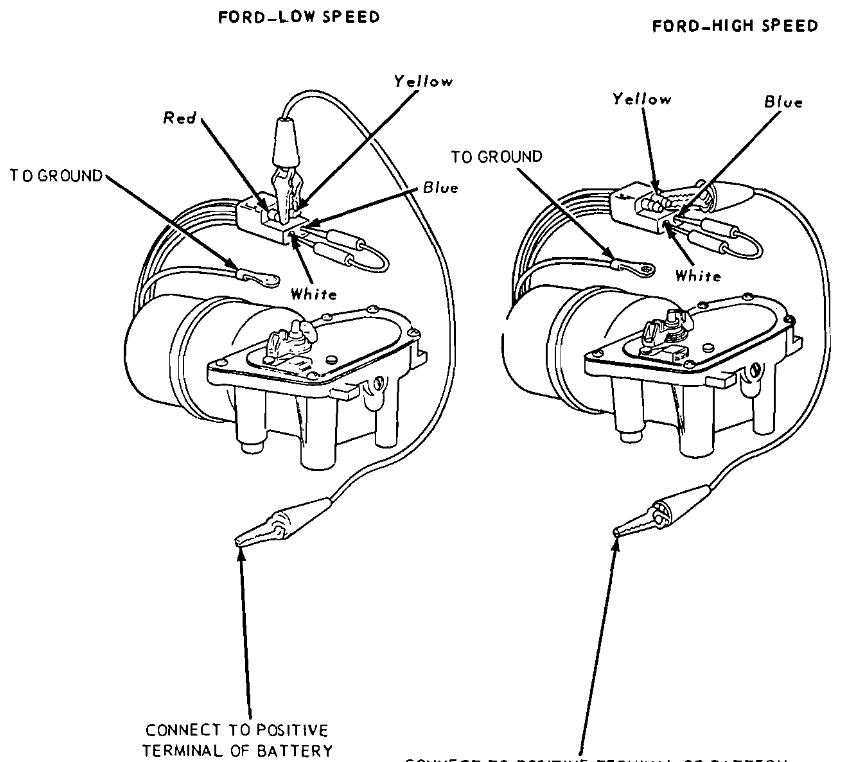
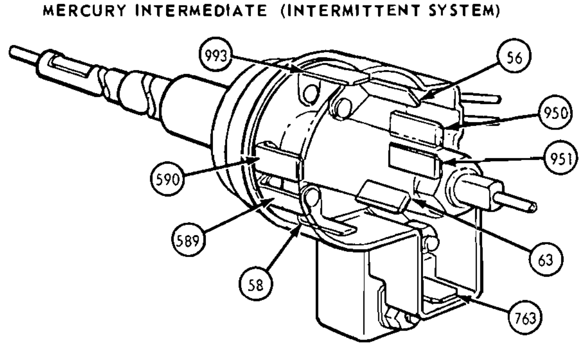


FIG. 1— High and Low Speed Motor Test Connections

MERCURY INTERMEDIATE (INTERMITTENT SYSTEM)



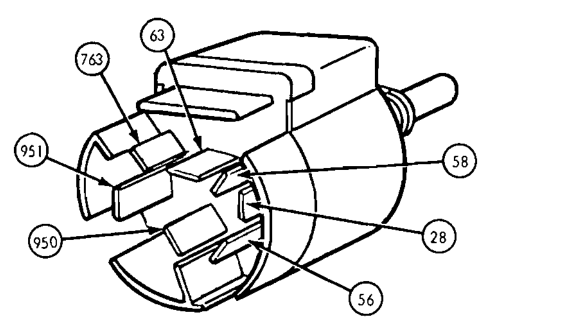
Using a self-powered test lamp or Rotunda ohmmeter, check the continuity through the switch terminals. Continuity should exist only as indicated in the following chart. Replace the switch if it does not meet the specified requirements.

SWITCH POSITION	CONTINUITY BETWEEN TERMINALS
Off (Park)	63-763 58-589
Low	58-63-763
High	56-63-763
Intermittent	63-763 56-993 58-590
Washer On	950-951

COLOR CODE OF WIRING TO WIPER SWITCH

56 Blue	763 Orange-White
58 White	950 White-Black
63 Red	951 Green-Black
589 Orange	993 Brown-White
590 Blue-White	

MERCURY INTERMEDIATE (STANDARD SYSTEM)



Using a self-powered test lamp or Rotunda ohmmeter, check the continuity through the switch terminals. Continuity should exist only as indicated in the following chart. Replace the switch if it does not meet the specified requirements.

SWITCH POSITION	CONTINUITY BETWEEN TERMINALS
Off (Park)	763-63 28-58
Low	763-63-58
High	763-63-56
Washer On	951-950

COLOR CODE OF WIRING TO WIPER SWITCH

28 Black
56 Blue
58 White
63 Red
763 Orange-White
950 White-Black
951 Green-Black

K 1991-A

FIG. 2— Wiper Switch Continuity Test Connections—Mercury Intermediate

SPEEDOMETER TESTS

LOOSE CABLE ATTACHING NUTS

1. Cable nuts should be tightened with pliers to approximately 18 to 25 in-lbs.

2. Cable nuts should start and run up freely by hand for at least three to four turns.

3. A loose cable nut can cause a bent cable core. Tightening will not always correct the problem.

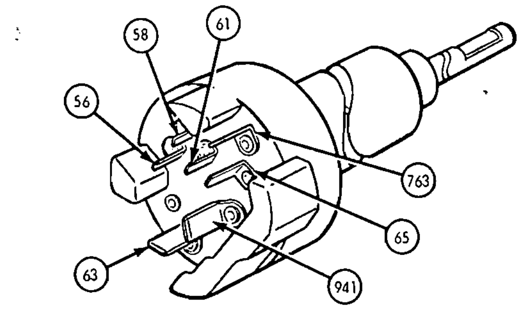
DEFECTIVE SPEEDOMETER HEAD TEST

Before removing a speedometer head, disconnect the cable at the head and insert a short section of cable core in the head. Rotate the section of core to check for any dragging or noise. The speedometer shaft should turn freely and evenly.

DEFECTIVE CABLE CORE AND HOUSING TEST

1. To check for a kinked cable core remove and wipe dry. Lay the core out straight on a flat surface and roll it back and forth. Any kinks or damage will be seen. Then take an end in each hand, allowing core

FORD



Using a self-powered test lamp or Rotunda ohmmeter, check the continuity through the switch terminals. Continuity should exist only as indicated in the following chart. Replace the switch if it does not meet the specified requirements.

SWITCH POSITION	CONTINUITY BETWEEN TERMINALS
Off (Park)	65-763 56-63 58-61
Low	61-63-763 56-58
High	61-763 56-58
Washer On	763-941

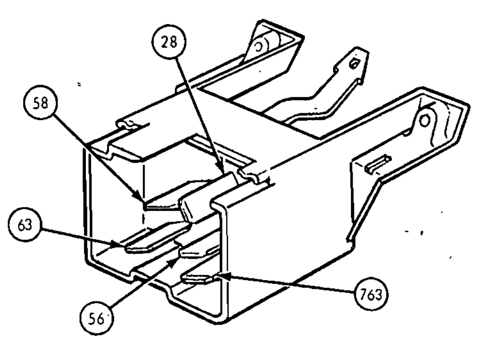
COLOR CODE OF WIRING TO WIPER SWITCH

56 Blue
58 White
61 Yellow
63 Red
65 Green
763 Orange-White
941 Black-White

K 2140-A

FIG. 3— Wiper Switch Continuity Test Connections—Falcon

FAIRLANE



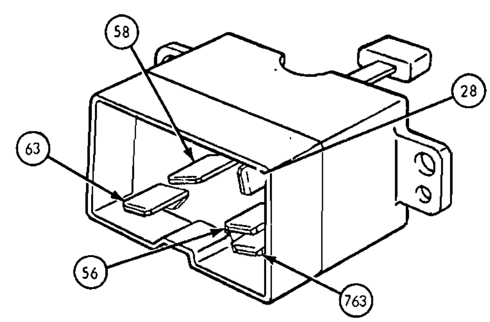
Using a self-powered test lamp or Rotunda ohmmeter, check the continuity through the switch terminals. Continuity should exist only as indicated in the following chart. Replace the switch if it does not meet the specified requirements.

SWITCH POSITION	CONTINUITY BETWEEN TERMINALS
Off (Park)	63-763 28-58
Low	58-63-763
High	56-63-763
Washer On	950A-951

COLOR CODE OF WIRING TO WIPER SWITCH

28 Black
56 Blue
58 White
63 Red
763 Orange-White

MUSTANG



Using a self-powered test lamp or Rotunda ohmmeter, check the continuity through the switch terminals. Continuity should exist only as indicated in the following chart. Replace the switch if it does not meet the specified requirements.

SWITCH POSITION	CONTINUITY BETWEEN TERMINALS
Off (Park)	63-763 28-58
Low	58-63-763
High	56-63-763
Washer On	58A-63A

COLOR CODE OF WIRING TO WIPER SWITCH

28 Black
56 Blue
58 White
63 Red
763 Orange-White

K1983-A

FIG. 4— Wiper Switch Continuity Test Connections—Fairlane and Mustang

to hang in approximately a 9-inch loop. Rotate both ends to be sure core turns evenly.

2. Routing of the cable housing is particularly important where the cable leaves the speedometer head. The optimum routing would provide that the cable and housing take virtually no change of direction for at least a length of 8 inches from the speedometer head.

3. When installing a new cable and housing it is necessary that the new assembly be guided and routed properly to eliminate any kinks.

4. Proper lubrication of the cable core is accomplished by a light application of B5AZ-19581-A lubricant after the cable has been wiped clean. A light film is all that is required.

DEFECTIVE DRIVE AND DRIVEN GEARS TEST

1. A score nicked or gouged driven gear is usually indicative of a defective drive gear on those vehicles that have the drive gear integral with the transmission output shaft. The output shaft should be carefully inspected for imperfections and replaced if necessary.

2. A driven gear with two or three adjoining teeth badly scored is indicative of improper assembly procedure. The gear should be inserted in the transmission while simultaneously turning the drive shaft. This will insure initial gear engagement and prevent gear damage. Force should never be used.

3. Whenever a drive gear is replaced, a new driven gear should also be installed, regardless of its apparent condition.

ELECTRIC WINDSHIELD WIPER DIAGNOSIS AND TEST PROCEDURES

WIPERS WILL NOT OPERATE (ONE OR BOTH SPEEDS)

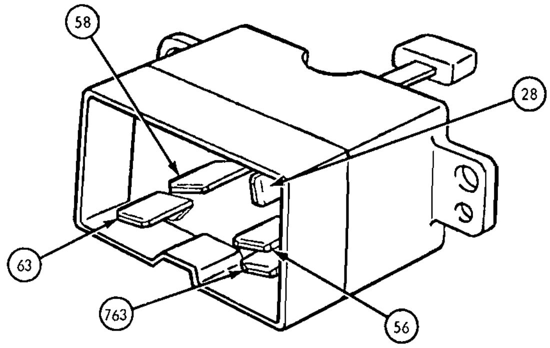
Inoperative wipers may be due to a defective switch, wiring or motor. If the wipers fail to operate at both speeds, binding linkage could be the cause.

Make a visual inspection of the wiper system for loose connections, burned or broken wires, and loose or missing parts. If the wires are burned, the circuit breaker in the switch is defective. Replace both the wiring harness and the switch.

Motor Test

Test the motor on the vehicle as

COUGAR



Using a self-powered test lamp or Rotundo ohmmeter, check the continuity through the switch terminals. Continuity should exist only as indicated in the following chart. Replace the switch if it does not meet the specified requirements.

SWITCH POSITION	CONTINUITY BETWEEN TERMINALS
Off (Park)	63-763 28-58
Low	58-63-763
High	56-63-763
Washer On	58A-63A

COLOR CODE OF WIRING TO WIPER SWITCH

28 Black
5o Blue
58 White
63 Red
763 Orange-White

K1993-A

FIG. 5— Wiper Switch Continuity Test Connections—Cougar

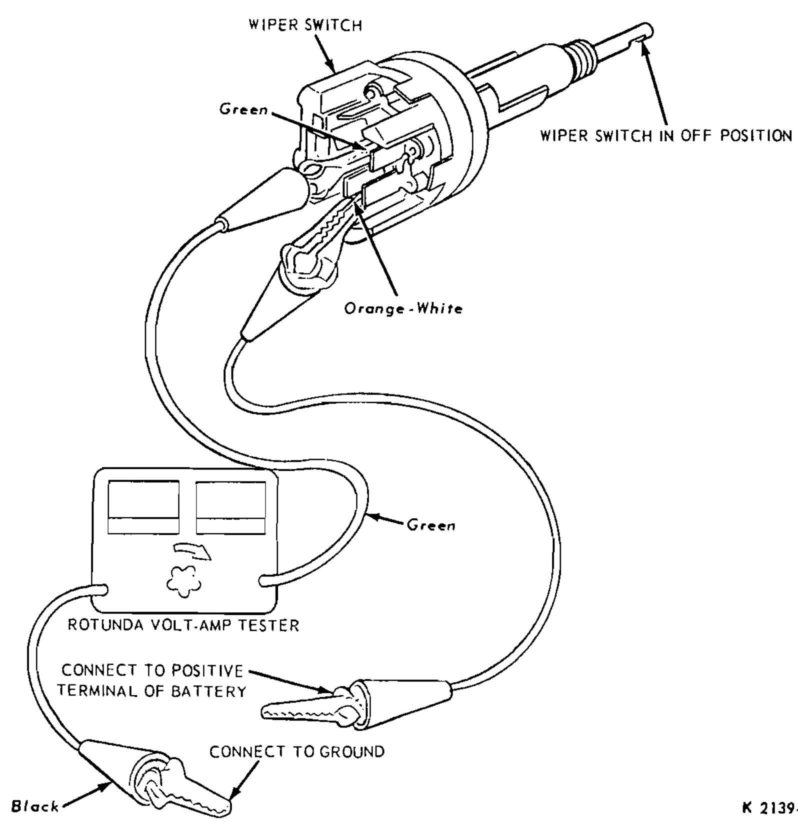


FIG. 6— Wiper Switch Circuit Breaker Test Connections—Fairlane, Falcon and Mustang

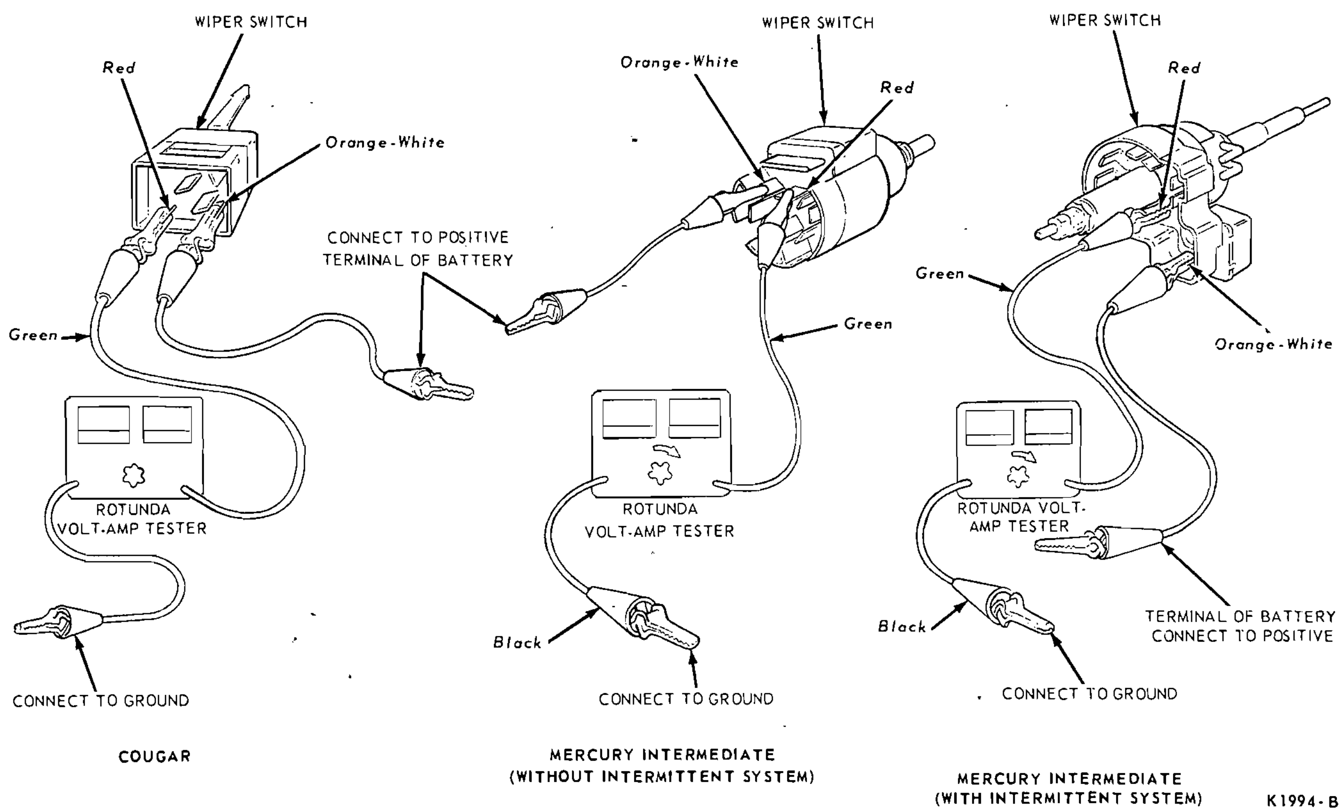


FIG. 7— Wiper Switch Circuit Breaker Test Connections—Mercury Intermediate and Cougar

shown in Fig. 1. Check that the motor ground makes contact with the car. If the motor operates on both speeds in these checks, the switch or wiring is defective. Test the switch and wiring according to instructions given in Wiper Switch Test. If the wipers operate at one speed but not at the other, replace the motor. If the wipers will not operate at either speed, check the ground by running a jumper from the ground strap to ground. If the wipers still will not operate, test the linkage.

Linkage Test

Check for correct linkage on the vehicle, then disconnect the linkage from the motor and move the linkage (wipers) through their complete strokes. If there is no bind in the linkage, replace the motor. Check the circuit breaker in the windshield wiper switch before the new motor is installed. Refer to Wiper Switch Circuit Breaker Test—High Current Pass Test.

Wiper Switch Test

Check the continuity between terminals of the switch as shown in Figs. 2, 3, 4 and 5. (As an alternate procedure plug a known good switch into the wiring harness and operate). If the switch is good, the wiring harness

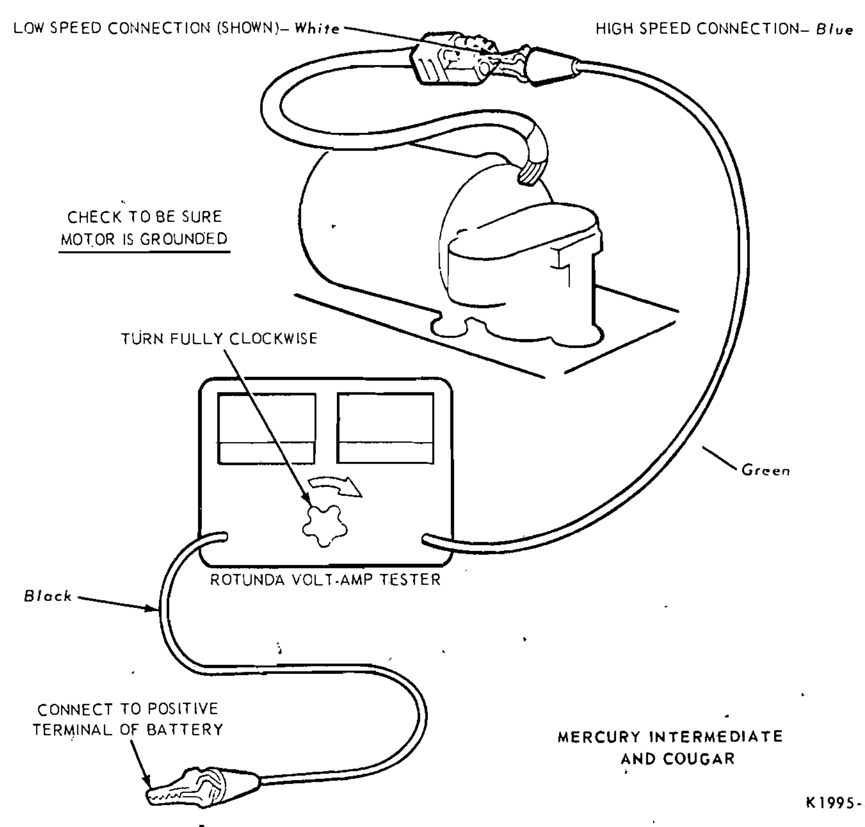


FIG. 8— Wiper Motor Current Draw Test Connections

is defective. Check the continuity of the wires and repair or replace the defective wiring.

Wiper Switch Circuit Breaker Test

Connect the variable resistance unit of a Rotunda Volt-Amp Tester as shown in Figs. 6 and 7. **Set the master control to maximum resistance position initially to prevent damage to the circuitry and ammeter.**

Low Current Pass Test. Adjust the variable resistance until the ammeter reads 7 1/2 amperes.

The ammeter should indicate 7 1/2 amperes for ten minutes. If the circuit will not indicate specified current for ten minutes (current drops to zero), the circuit breaker is defective. Replace the switch.

High Current Pass Test. Adjust the master control until the ammeter indicates 13 amperes. The circuit should open within 30 seconds (current drops to zero), otherwise the circuit breaker is defective and the switch must be replaced.

INTERMITTENT WIPER OPERATION (ONE OR BOTH SPEEDS)

Intermittent operation of the wipers may be due to a defective switch (circuit breaker), intermittent ground, loose connections, or a defective motor. Intermittent operation at both speeds may be due to an excessive effort caused by binding linkage or wrong wiper blades. Inspect the system for these defects.

Current Draw Test

Disconnect the linkage. Test the motor on the vehicle for current draw at the speed at which intermittent operation occurs as shown in Fig. 8. If the current draw exceeds 3 amperes, replace the motor. If the current draw is less than 3 amperes, test the switch for continuity (refer to Wiper Switch Test), and its circuit breaker, for low current pass (refer to Wiper Switch Circuit Breaker Test).

WIPERS WILL NOT STOP OR WILL NOT STOP IN PARK POSITION

Improper parking or failure to stop may be due to an open circuit (broken wire), or a bad connection, defective motor (park switch), or a defective wiper switch.

Inspect the wiring for an open circuit or poor connection.

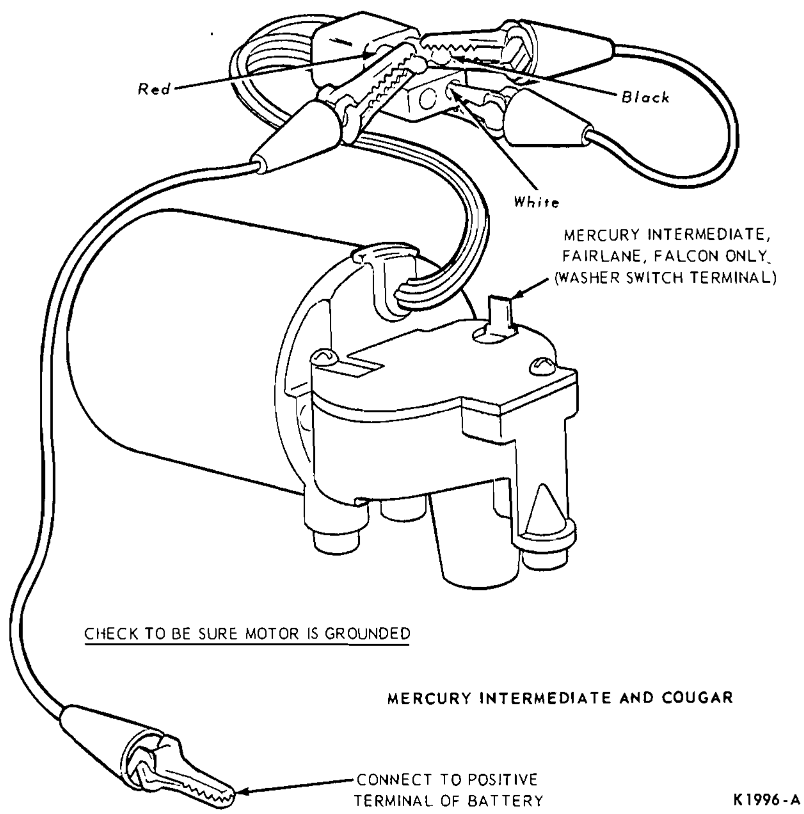


FIG. 9— Wiper Motor Park Switch Test Connections

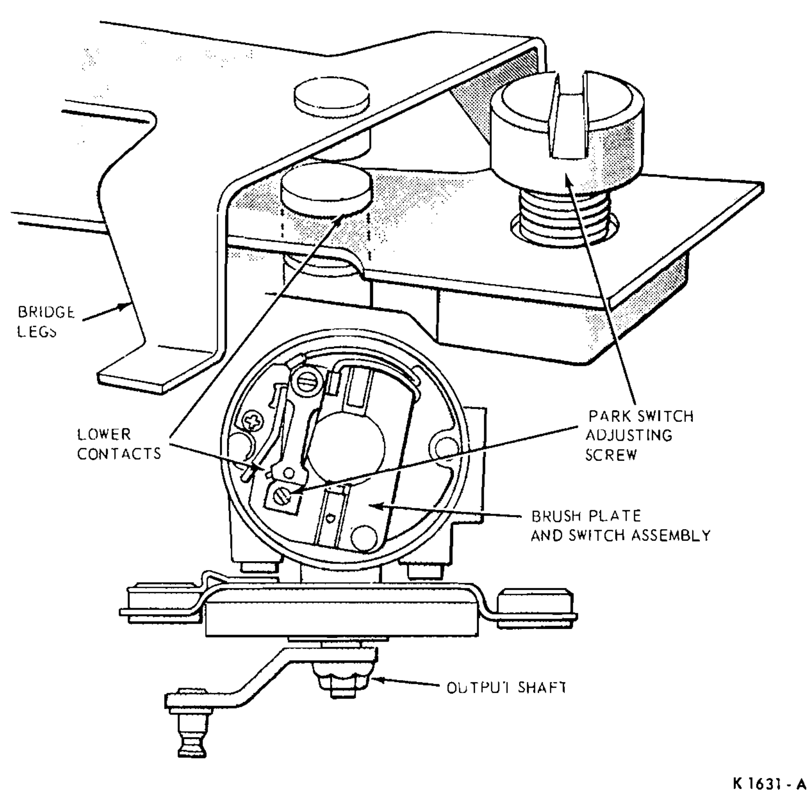


FIG. 10— Windshield Wiper Motor Park Switch Adjustment

Motor Park Switch Test

Stop the wiper system with the ignition switch so that the wiper blades are not in park position. Connect jumper wires as shown in Fig. 9. Wipers should not run more than one full cycle and park. If the motor will not park or will not run to park position, the park switch is maladjusted or defective. If the motor stops correctly, the switch or wiring harness is defective (see Wiper Switch Test).

NOISY WIPER SYSTEM

Noisy system operation could be caused by loose or misaligned motor mounting, improper wiper arms or blades, or loose or worn linkage.

Disconnect the linkage from the motor and run the motor to determine whether the noise is caused by the motor. Check the motor mounting for misalignment or grounding against cowl sheet metal.

Visually inspect the linkage for loose attaching bolts, loose pivots in the linkage, and loose wiper arms or blades.

WIPER MOTOR PARK SWITCH ADJUSTMENT

With jumper wires connected as shown in Fig. 9, the motor should move to the park position. If it does, the motor is all right and the fault lies in the panel switch or wiring. If the motor does not park, proceed with the following park switch adjustment (Fig. 10).

Remove the motor thru bolts and remove the motor cup and armature.

Rotate the output shaft until the park switch lower contacts are firmly closed as shown.

Rotate the adjusting screw clockwise until the park switch lower contacts just open.

Rotate the adjusting screw counterclockwise one full turn.

Check the bridge to assure that the legs are contacting the brush plate when the lower contacts are closed.

Install the armature, motor cup and thru bolts.

2 DESCRIPTION AND OPERATION

Refer to Wiring Diagram Manual Form 7795P-67 for locations of wiring harnesses. Schematics are shown in Group 19 of this manual.

All of the instruments are electrically operated except the speedometer. Brightness of the instrument panel lights is controlled by a rheostat on the lighting switch.

INSTRUMENT VOLTAGE REGULATOR

The constant voltage regulator (Fig. 11) used with the fuel, temperature, and oil gauges maintains an average value of 5.0 volts at the gauge terminals.

The regulator operates by means of a bimetallic arm and a heating coil. When the ignition switch is turned on, the heating coil heats the bimetallic arm causing it to bend and break the contacts, disconnecting the voltage supply from the heating coil. The bimetallic arm then cools and brings the contacts together again. The making and breaking of the contacts, causes a pulsating voltage, with an effective average value of 5.0 volts to be supplied to the gauges. Although these pulsations are quite rapid, there is in each gauge a bimetallic arm which changes temperature quite slowly, and this assures steady average readings.

As the pulsating voltage would normally cause radio interference, a radio interference suppression choke is connected in series with the constant voltage regulator supply wire.

FUEL GAUGE

The fuel gauge consists of a sending unit, located on the gas tank, and a remote register unit (fuel gauge) mounted in the instrument cluster. The remote register unit pointer is controlled by a bimetallic arm and heating coil. The sending unit is a rheostat that varies its resistance depending on the amount of fuel in the tank. The rheostat is operated by a float control. As the fuel level rises or falls the float control arm moved by the float, varies the resistance.

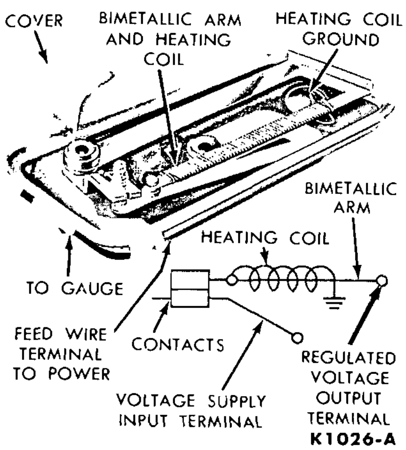


FIG. 11—Instrument Voltage Regulator

TEMPERATURE GAUGE

The temperature gauge system consists of a sending unit mounted at the top front of the engine on the V-8 (Fig. 12 or 13), left rear of the engine on the six, and a remote register unit, (temperature gauge) mounted in the instrument cluster.

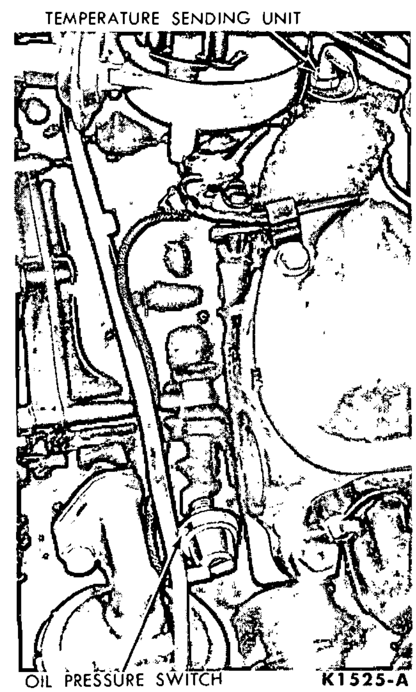


FIG. 12—Temperature Sender and Oil Pressure Switch—8 Cylinder Engine

Changes of engine temperature vary the resistance of the sending unit which in turn operates the temperature gauge.

CHARGE INDICATOR LIGHT —EXCEPT MERCURY INTERMEDIATE

A red alternator charge indicator light is used. This light flashes on if the battery is discharging and the alternator is not supplying current.

When the ignition switch is closed, battery current flows through the charge indicator light and 15-ohm parallel resistor, and through the regulator voltage limiter contacts to the field.

When the alternator builds up enough voltage to close the field relay contacts, full voltage is applied to the field, and the charge indicator light goes out.

CHARGE INDICATOR GAUGE—MERCURY INTERMEDIATE

The charge indicator gauge is an ammeter, which indicates whether the battery is being charged or discharged. The ammeter is non-adjustable and should be replaced if proven to be defective.

OIL PRESSURE INDICATOR LIGHT

A red indicator light flashes on when the oil pressure is below a safe value. The light should come on when the ignition switch is first turned on, and it should go out when the engine comes up to speed. The light is connected between the oil pressure switch unit mounted on the engine at the left rear on the six, above the oil filter on the V-8 (Fig. 12), and the coil terminal of the ignition switch.

The sending unit used with the warning indicator light system is not interchangeable with the sending unit used with the gauge system. Refer to the Ford Car Master Parts Catalog for proper parts usage.

Misuse of the sending units will result in inoperative oil pressure warning systems and damaged sending units or gauges.

OIL PRESSURE INDICATOR GAUGE

The meter-type oil pressure gauge consists of a sending unit on the engine above the oil filter on the V-8 (Fig. 12), at the left rear on the six, and a remote register unit in the instrument cluster.

The sending unit operates by varying resistance according to actual oil pressure against it, which in turn operates the oil pressure gauge.

TURN INDICATOR

The turn indicator uses the dual filament parking lights as indicator lights.

The turn indicator flasher is located in the back of the instrument panel. The emergency warning flasher is located on the right side of the upper steering column hub.

On the Mustang the flasher is mounted on the front side of the air duct.

EMERGENCY WARNING FLASHER—EXCEPT COUGAR

The emergency warning flasher system is controlled by the emergency warning switch portion of the turn signal switch assembly in the steering column. A separate flasher assembly is provided for this system. All turn signal lights can be made to flash at the same time by pushing in the actuating knob of the emergency warning switch located on the side of the steering column.

EMERGENCY WARNING FLASHER SYSTEM—COUGAR

The emergency flasher warning system is controlled by a push-pull switch located on the right hand side of the steering column opposite the turn signal indicator lever, and is part of the turn signal switch.

The system utilizes the sequential turn signal flasher by the use of relays and unique wiring routing. Signal lights can be made to flash at the same time by closing the contacts of the switch by pushing the switch plunger in. The canceling action is obtained by manually pulling the switch plunger out from the steering column.

SPEEDOMETER

The speedometer is connected to the output shaft of the transmission by means of a flexible shaft, and a drive gear located inside the transmission. The flexible shaft drives the speedometer which registers speed in miles per hour and also drives an odometer which records distance traveled in miles and tenths of a mile.

WINDSHIELD WIPER—MERCURY INTERMEDIATE

The Mercury Intermediate wiper provides high and low speed constant wiping action, and also intermittent low speed (6-30 cycles per minute) intermittent wiping action. This low speed operation is based not on a low speed wiping stroke but on an adjustable dwell period in the park position.

The intermittent wiper is operated through the use of a dual knob. The outer or large knob, when in the center position, turns the system off.

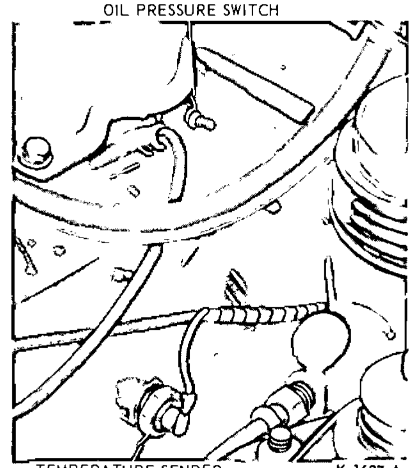


FIG. 13—**Temperature and Oil Pressure Sender—6 Cylinder Engine**

When turned fully clockwise, the wiper is in the constant high speed setting. When turned fully counterclockwise, the wiper goes to the low speed range. The intermittent wiper action is controlled by the inner, or small knob.

The intermittent wiper control is an electro-pneumatic system, a governor located in the engine compartment, that allows selection of either varying dwell between wipe cycles or continuous wiper action thru application of variable opposing vacuum and pressure within the system.

With the control selector in the instrument panel turned to intermittent wiper control, engine manifold vacuum is applied to the upper chamber of the governor (Sketch I, Fig. 14). Atmospheric pressure in the lower chamber then moves the diaphragm upward. Simultaneous rotation of the governor valve cam thru the spiral action of the follower applies manifold vacuum to the diaphragm of the normally closed electrical switch. The switch diaphragm is moved downward compressing the diaphragm spring and moving the switch into the park position. The wiper blades then move to the park position and remain there. (Sketch II, Fig. 14).

Rotation of the governor valve cam that applied vacuum to the governor switch also opened the upper governor chamber to atmosphere. The compressed diaphragm spring applies downward pressure to the diaphragm creating super atmosphere in the lower chamber. This is allowed to bleed off thru a variable orifice in the control selector. The size of this orifice is determined by the position of the intermittent selector (inner knob) and establishes the length of wiper cycle dwell (Sketch II, Fig. 14).

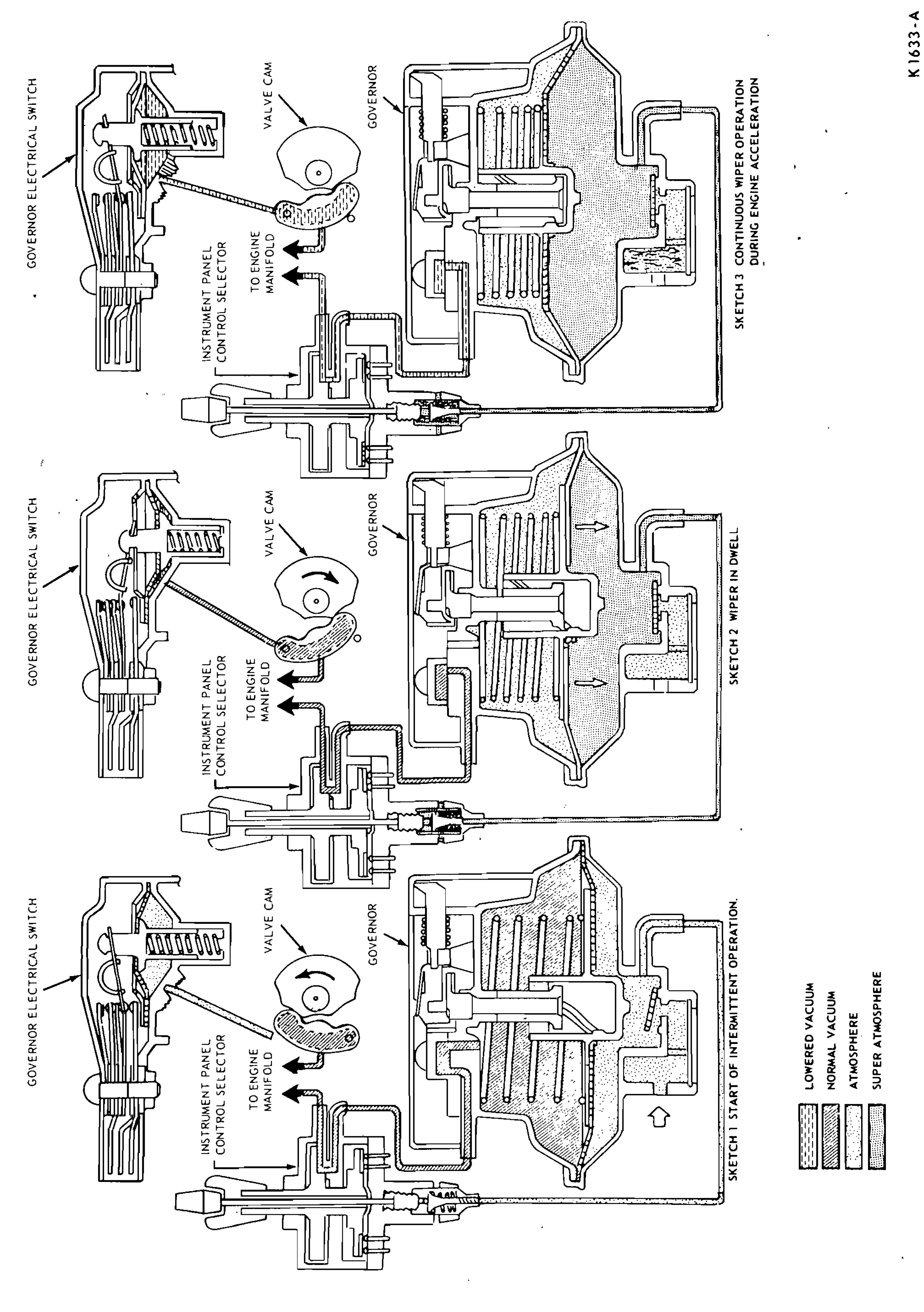


FIG. 14—Electro-Pneumatic Governor For Intermittent Windshield Wiper

As the diaphragm moves downward, the governor valve cam is rotated thru the spiral action of the cam follower, opening the lower chamber of the electrical switch diaphragm to atmosphere. The compressed diaphragm spring moves the switch into the closed position, actuating the wiper motor. Simultaneously, the rotational movement of the valve cam applies manifold vacuum to the upper chamber of the governor, thus beginning a new cycle.

If the engine is subjected to sudden acceleration as in passing, the available manifold vacuum will be greatly reduced. When the vacuum loss becomes sufficient to allow the electrical switch diaphragm spring to overcome the vacuum, the switch will be moved to the closed position providing continuous wiper operation. This will continue until the engine has returned to an operating condition that will provide normal manifold vacuum. The wipers will then return to whatever wiper cycle dwell has been previously selected.

In the same manner as above, under engine acceleration, if any loss of vacuum or pressure in the intermittent control system occurs due to a mechanical failure or malfunction, the wipers will automatically shift to continuous operation, thereby rendering the system fail safe (Sketch III, Fig. 14).

FOOT-OPERATED WINDSHIELD WASHER SYSTEM—MUSTANG AND COUGAR

The windshield washer system utilizes a foot operated bellows type pump and electrical switch assembly, co-ordinated with the wiper motor through the electrical windshield wiper switch. Pump operation is obtained by depressing and releasing the foot pedal with a pumping action to eject a spray of water onto the windshield glass.

The washer pump system is co-ordinated with the windshield wipers by means of a switch attached to the washer pump which is actuated when the pump pedal is depressed. Closing of the switch contacts completes a circuit which operates the wiper motor at low speed. When the pump pedal is released, the contact positions are changed causing the wiper motor to cycle to the OFF (Park) position.

ELECTRIC WINDSHIELD WASHER PUMP—EXCEPT MUSTANG AND COUGAR

The windshield washer pump for the Falcon, Fairlane, Mercury Intermediate and Mustang is an electrically powered system consisting of a control switch, washer pump, washer reservoir, and water lines. The washer pump is designed to eject an interrupted stream of fluid only when the windshield wiper motor is in operation and as long as the control switch is held in the closed position.

3 IN-CAR ADJUSTMENTS AND REPAIRS

WINDSHIELD WIPER BLADE ADJUSTMENT

Turn the ignition switch to the accessory position momentarily, with the wiper switch off. After bringing the pivot shafts to their park positions, install the wiper blades so that they lie flat against the lower edge of the windshield.

4 REMOVAL AND INSTALLATION

INSTRUMENT CLUSTER—EXCEPT MUSTANG AND COUGAR

1. Disconnect the battery cable.
2. Disconnect the speedometer cable from the speedometer head.
3. Remove the screws retaining the instrument cluster assembly to the instrument panel and tilt the cluster forward.
4. Disconnect the wiring and the bulb sockets and remove the cluster assembly.
5. Position the cluster and connect the wiring and the bulb sockets.
6. Install the instrument cluster assembly to the instrument panel with the six retaining screws.
7. Connect the speedometer cable and the battery cable.
8. Check the operation of all gauges, lights, and signals.

To replace the fuel gauge, temperature gauge, oil pressure gauge, charge indicator gauge, and speedometer, it is necessary to remove the instrument cluster assembly.

INSTRUMENT CLUSTER COUGAR AND COUGAR XR-7

REMOVAL

Instrument cluster components are accessible by removing the cluster as an assembly.

1. Disconnect the battery ground cable from the battery.
2. Cover the steering column to prevent paint damage.
3. Remove the instrument panel, front pad assembly retaining screws and remove the pad assembly.
4. Remove the four screws retaining the heater control assembly to the instrument panel and position the control assembly outward.
5. Reaching through the heater control opening, disconnect the speedometer cable from the speedometer.
6. Remove the three ash tray receptacle retaining screws. Disconnect the cigar lighter element wiring connector and remove the ash tray receptacle.
7. Reaching through the ash tray opening, remove the nut and washer which retains the inboard end of the instrument cluster to the instrument panel.
8. Remove the seven external screws retaining the instrument cluster to the instrument panel.
9. Position the cluster assembly outward, disconnect the two multiple connectors and remove the instrument cluster assembly.

INSTALLATION

1. To install, position the cluster assembly on the steering column and connect the multiple connectors.
2. Position the cluster assembly to the instrument panel and install the seven external retaining screws.
3. Reaching through the ash tray opening, install the instrument cluster assembly inboard end retaining nut and washer.
4. Position the ash receptacle and install the three retaining screws.
5. Reaching through the heater control opening, connect the speedometer cable to the speedometer.

6. Position the heater control to the instrument panel and install the four retaining screws.
7. Position the front instrument panel pad and install the pad retaining screws.
8. Connect the battery ground cable to the battery.
9. Check the instruments and cluster bulbs for proper operation. Remove the steering column protective cover.

INSTRUMENT CLUSTER —MUSTANG

Instrument cluster components are accessible by removing the cluster as an assembly.

1. Disconnect the battery ground cable from the battery.
2. Cover the steering column to prevent paint damage.
3. Remove the four screws retaining the heater control assembly to the instrument panel and position the control assembly outward.
4. Reaching through the heater control opening, disconnect the speedometer cable from the speedometer.
5. Remove the three ash tray receptacle retaining screws. Disconnect the cigar lighter element wiring connector and remove the ash tray receptacle.
6. Reaching through the ash tray opening, remove the nut which retains the inboard end of the instrument cluster to the instrument panel.
7. Remove the six external screws retaining the instrument cluster to the instrument panel.
8. Position the cluster assembly outward, disconnect the two multiple connectors and remove the instrument cluster assembly.
9. To install, position the cluster assembly on the steering column and connect the multiple connectors.
10. Position the cluster assembly to the instrument panel and install the six external retaining screws.
11. Reaching through the ash tray opening, install the instrument cluster assembly inboard end retaining nut and washer.
12. Position the ash receptacle and install the three retaining screws.
13. Reaching through the heater control opening, connect the speedometer cable to the speedometer.
14. Position the heater control to the instrument panel and install the four retaining screws.
15. Connect the battery ground cable to the battery.
16. Check the instrument and cluster bulbs for proper operation. Remove the steering column protective cover.

INSTRUMENT PANEL CONTROL IDENTIFICATION LENS— FAIRLANE

1. Disconnect the battery ground cable.
2. Remove the radio knobs and nuts.
3. Disconnect the speedometer cable.
4. Remove the screws from the cluster assembly and position it outward.
5. Disconnect the bulbs, constant voltage regulator and ground wire, clock and the fuel gauge. Move the cluster assembly to a bench..
6. Remove the clock knob and the screws retaining the rear cluster cover which retains the speedometer, clock, fuel gauge, and bulbs for the alternator, oil pressure, and hot and cold water temperature.
7. Remove the screws from the right side front of the cluster. Remove the mask and the lens.
8. Insert and position the new lens and retaining screws.
9. Position the rear cover assembly to the front of the cluster and install the retaining screws. Install the clock knob and screw.
10. Position the cluster assembly and connect all leads and bulbs.
11. Position the cluster assembly to the instrument panel and install the retaining screws.
12. Position the radio to the cluster and install the nuts and bulbs.
13. Connect the speedometer cable.
14. Connect the battery and check the operation of all disconnected parts.

INSTRUMENT PANEL CONTROL IDENTIFICATION LENS—MUSTANG, COUGAR AND COUGAR XR-7

1. Remove the instrument cluster from the instrument panel (in this part).
2. Remove the nine cluster rear housing retaining screws and remove the rear cluster housing and gauges.
3. Remove three lens retaining screws and remove the lens and mask.
4. Position a new lens and mask in the cluster and install the three lens retaining screws.
5. Position the rear housing to the cluster and install the nine rear housing retaining screws.
6. Install the instrument cluster in the instrument panel.
7. Check the gauge operation.

INSTRUMENT VOLTAGE REGULATOR—MERCURY INTERMEDIATE

1. Disconnect the battery ground cable.
2. Disconnect the two leads from the regulator.
3. Remove the regulator mounting screw and the regulator.
4. Transfer the radio choke to the new regulator and install the regulator.
5. Connect the regulator leads.
6. Connect the battery and check the regulator operation.

INSTRUMENT VOLTAGE REGULATOR—FALCON

1. Disconnect the battery ground cable from the battery.
2. Disconnect the two spade wiring connectors from the regulator.
3. Remove the screw which retains the regulator to the back of the instrument cluster and remove the regulator.
4. Position the replacement regulator on the back of the instrument cluster and install the regulator retaining screw.
5. Connect the wiring connectors to the regulator terminals.
6. Connect the battery ground cable to the battery.
7. Check the instruments for proper operation.

INSTRUMENT VOLTAGE REGULATOR—FAIRLANE

1. Disconnect the battery ground cable.
2. Remove the radio knobs, mounting nuts and radio.
3. Remove the screws retaining the cluster assembly to the instrument panel. Position the cluster outward.
5. Disconnect the wire leads and remove the mounting screw from the constant voltage regulator and remove the regulator.
6. Position the new constant voltage regulator, install the mounting screw and connect the wire leads.
7. Position the cluster assembly to the instrument panel and install the retaining screws.
8. Position the radio to the cluster and install the nuts and knobs.
9. Connect the speedometer cable.
10. Connect the battery and check the operation of all disconnected parts.

INSTRUMENT VOLTAGE REGULATOR—MUSTANG

1. Remove the instrument cluster from the instrument panel.
2. Remove the wiring connectors from the regulator terminals.
3. Remove the regulator retaining screw and remove the regulator.
4. Position the new regulator and install the retaining screw.
5. Connect the wiring connectors to the regulator terminals.
6. Install the instrument cluster to the instrument panel.
7. Check the gauge operation.

INSTRUMENT VOLTAGE REGULATOR—COUGAR

1. Disconnect the ground cable from the battery.
2. Remove the four screws retaining the heater control to the instrument panel and position the control assembly outward.
3. Reaching through the heater control opening, disconnect the spade connectors from the constant voltage regulator (located to the left of the speedometer).
4. Remove the nut and washer which retains the regulator to the stud on the back of the instrument cluster.
5. Position the replacement regulator on the mounting stud and install the retaining nut and washer.
6. Connect the wiring connectors to the regulator.
7. Position the heater control to the instrument panel and install the four retaining screws.
8. Connect the battery ground cable to the battery.
9. Check the gauge operation.

FUEL GAUGE AND/OR TEMPERATURE GAUGE —FALCON

REMOVAL

1. Disconnect the ground cable from the battery.
2. Disconnect the speedometer cable from the speedometer.
3. Cover the steering column to prevent paint damage.
4. Disconnect the windshield washer/wiper switch wiring connector plugs.
5. Remove the heater control knobs.
6. Remove the two heater control-to-instrument panel retaining screws.
7. Remove the six screws which retain the instrument cluster to the instrument panel.
8. Remove two nuts at the lower edge of the heater control which retain the control to the instrument cluster.
9. Disconnect the bulb and wiring connector and remove the instrument cluster.
10. Remove the screws which retain the rear cluster cover to the cluster.
11. Remove the four nuts which retain the fuel and temperature gauges to the cover and remove the temperature or fuel gauge as required.

INSTALLATION

1. Position the gauge assembly to the cluster cover and install the gauge retaining nuts.
2. Position the cluster cover assembly to the cluster and install the cluster cover retaining screws.
3. Secure all bulbs and wiring connectors in the cluster cover.
4. Position the heater control on the cluster and install the two heater control retaining nuts.
5. Position the cluster assembly to the instrument panel, connect the wiring connectors and install the cluster-to-instrument panel retaining screws.
6. Install the two top heater control retaining screws.
7. Install the heater control knobs.
8. Connect the windshield wiper/washer switch wiring connector.
9. Connect the speedometer cable to the speedometer.
10. Connect the battery ground cable to the battery.
11. Check the operation of instruments and controls.

FUEL GAUGE AND TEMPERATURE GAUGE—COUGAR, COUGAR XR-7 AND MUSTANG

The fuel and temperature gauges are replaced as a unit.

1. Remove the instrument cluster. See Instrument Cluster Assembly — Cougar.
2. Remove the nine rear cluster housing retaining screws. Remove the rear cluster housing and gauges.
3. Remove the four nuts retaining the gauge assembly to the housing and remove the gauge assembly.
4. Position the gauge assembly in the cluster rear housing and install the four gauge retaining nuts.
5. Position the cluster rear housing assembly to the cluster and install the nine retaining screws.
6. Install the instrument cluster in the instrument panel.

FUEL GAUGE—MERCURY INTERMEDIATE

1. Disconnect the battery ground cable.
2. Cover the steering column, remove the eight instrument cluster retaining screws and position the cluster outward.
3. Disconnect the clock wires, and disconnect the speedometer cable.
4. Disconnect the cluster connector plug and remove the cluster to a bench.
5. Remove the clock reset knob, remove ten screws and remove the back can from the cluster front housing.
6. Disconnect the two fuel gauge push-on connectors, remove the gauge mounting nuts and remove the gauge assembly.
7. Position the new gauge and install the two mounting nuts with the insulator. Install the two push-on connectors.
8. Position the back can to the cluster and install the mounting screws. Install the clock reset knob.
9. Position the cluster near the instrument panel. Connect the clock, the multiple connector and the speedometer cable.
10. Position the cluster to the instrument panel and install the mounting screws.
11. Connect the battery cable and check the fuel gauge operation.

FUEL GAUGE—FAIRLANE

1. Disconnect the battery ground cable.
2. Remove the radio knobs, mounting nuts and radio.
3. Disconnect the speedometer cable.
4. Remove the screws retaining the cluster assembly to the instrument panel. Position the cluster assembly outward.
5. Disconnect the bulbs, constant voltage regulator, the clock and fuel gauge. Remove the cluster assembly to a bench.
6. Remove the clock knob and the screws retaining the rear cluster cover.

The cover retains the speedometer, clock and fuel gauge, also the bulbs for the alternator charge indicator, oil pressure gauge and the hot-cold engine temperature indicator.

7. Remove the screws retaining the speedometer head to the cover and four rubber insulators. Remove the head.
8. Remove the nuts retaining the fuel gauge, and remove the gauge.

9. Install the new fuel gauge with mounting nuts.
10. Position the speedometer and install the retaining screws at the rear. Install the four rubber insulators in the front.
11. Position the rear cover assembly to the front of the cluster and install the retaining screws. Install the clock knob and screw.
12. Position the cluster assembly. Connect all of the wire leads and bulbs.
13. Position the cluster assembly to the instrument panel and install the retaining screws.
14. Position the radio to the cluster and install the mounting nuts and knobs.
15. Connect the speedometer cable.
16. Connect the battery and check the operation of all disconnected parts.

FUEL SENDING UNIT

1. Remove the fuel from the fuel tank.
2. Disconnect the fuel gauge sending unit wire from the sending unit.
3. Loosen the hose clamp and disconnect the tank line at the sending unit.
4. Remove any dirt that has accumulated around the sending unit so that it will not enter the tank.
5. Turn the sending unit retaining ring counterclockwise and remove the unit, retaining ring, and mounting gasket.
6. Clean the fuel gauge sending unit mounting surface at the fuel tank.
7. Position the sending unit and mounting gasket on the fuel tank and secure with the retaining ring.
8. Connect the sending unit wire and the fuel tank line.
9. Fill the tank with the fuel removed.
10. Check the fuel gauge operation and check for leaks.

TEMPERATURE GAUGE—MERCURY INTERMEDIATE

REMOVAL

1. Disconnect the battery ground cable from the battery.
2. Remove the clock reset knob.
3. Cover the steering column to prevent paint damage.
4. Remove the eight instrument cluster-to-instrument panel retaining screws.
5. Position the clutch outward. Disconnect the clock wires. Disconnect the speedometer cable from the speedometer.
6. Disconnect the wiring connector plug and remove the cluster assembly from the instrument panel.
7. Remove the ten cluster rear cover retaining screws and remove the cluster rear cover.
8. Disconnect the gauge wiring connectors. Remove the two gauge retaining nuts and insulators. Remove the gauge.

INSTALLATION

1. Position the gauge in the cluster cover and install the retaining nuts and insulators. Connect the gauge wiring connectors.
2. Position the cluster rear cover to the cluster and install the ten retaining screws.
3. Install the clock reset knob.
4. Position the cluster assembly to the instrument panel and connect the clock wires, the cluster multiple wiring connector and the speedometer cable.
5. Install the cluster assembly-to-instrument panel retaining screws.
6. Connect the battery ground cable to the battery.
7. Check the operation of the instruments and controls.

TEMPERATURE SENDING UNIT

1. Disconnect the temperature sending unit wire from the sending unit.
2. Prepare the new temperature sending unit for installation by applying a small amount of conductive water resistant sealer C3AZ-19554-B, to the threads.
3. Remove the temperature sending unit from the cylinder head and immediately install the new temperature sending unit.
4. Connect the wire to the temperature sending unit.
5. Start the engine and check the sending unit operation.

CHARGE INDICATOR AND/OR OIL PRESSURE INDICATOR GAUGE—MUSTANG

1. Remove the instrument cluster from the instrument panel.
2. Remove the nine cluster rear housing retaining screws and remove the cluster rear housing.
3. Remove the four nuts retaining the gauges in their housing and remove the gauge to be replaced.
4. Position the gauge in the housing and install the four retaining nuts.
5. Position the cluster rear housing assembly to the cluster and install the nine retaining screws.
6. Install the instrument cluster in the instrument panel.
7. Check the gauge operation.

OIL PRESSURE SENDING UNIT OR OIL PRESSURE SWITCH

To replace the unit, disconnect the wire from the terminal. Remove the unit from the engine. Apply conductive sealer C3AZ-19554-B to the threads of the new unit and install the unit. Connect the wire to the terminal and check the operation of the unit.

The sending unit used with the warning indicator light system is not interchangeable with the sending unit used with the gauge system. Refer to the Ford Car Master Parts Catalog for proper parts usage.

Misuse of the sending units will result in inoperative oil pressure warning systems and damaged sending units or gauges.

CHARGE INDICATOR GAUGE—MERCURY INTERMEDIATE

1. Disconnect the battery.
2. Disconnect the speedometer cable.
3. Remove the screws retaining the cluster assembly to the instrument panel and position it outward.
4. Disconnect the bulbs, temperature gauge, fuel gauge, constant voltage regulator, and charge indicator and remove the assembly to a bench.
5. Remove the screws retaining the back cover of the cluster to the front of the cluster. There is no clock in this cluster. The light for the oil pressure indicator is in the charge indicator gauge.
6. Remove the nuts retaining the charge indicator gauge.
7. Position the new gauge and install the retaining nuts.
8. Position the rear cover to the front of the cluster and install the retaining screws. The rear cover retains all the gauges and the speedometer head.
9. Position the cluster assembly and connect all leads and bulbs.
10. Install the cluster assembly to the instrument panel and secure it with screws.
11. Connect the speedometer cable.
12. Connect the battery and check the operation of all disconnected parts.

CHARGE INDICATOR GAUGE—COUGAR XR-7

1. Disconnect the battery ground cable.

2. Remove the instrument cluster assembly (in this part).
3. Remove the nine rear cluster housing retaining screws and remove the cluster housing.
4. Disconnect the two push on connectors and remove the two charge indicator gauge retaining nuts and remove the gauge.
5. Position the gauge assembly to the cluster housing and install the two retaining nuts and connect the push on connectors.
6. Position the cluster rear housing assembly and install the nine retaining screws.
7. Install the instrument cluster in the instrument panel.
8. Connect the battery ground cable and check the operation of the gauge.

ELECTRIC CLOCK—MUSTANG AND COUGAR

1. Remove the instrument cluster (in this section).
2. Remove the clock re-set knob and nut.
3. Disconnect the wiring connector from the clock. Remove three clock retaining screws and remove the clock.
4. Position the clock to the instrument cluster. Install the three retaining screws and connect the wiring connector.
5. Install the instrument cluster in the instrument panel. Install the clock reset knob.
6. Check the clock operation.

ELECTRIC CLOCK—COUGAR XR-7 (CONSOLE MOUNTED)

1. Remove the radio control knobs.
2. Remove the two screws which retain the console front pad. Pry out the pad (four retaining clips).
3. Disconnect the two wiring connectors and the bulb from the clock.
4. Remove the three nuts which retain the clock to the pad and remove the clock from the pad.
5. To install the clock, position it to the console pad and install the three retaining nuts.
6. Connect the two clock wiring connectors and the clock bulb.
7. Snap the console pad in place at the radio and install the two pad retaining screws and the radio control knobs.

ELECTRIC CLOCK—FAIRLANE

1. Disconnect the battery ground cable from the battery.
2. Remove the clock set knob.
3. Disconnect the clock wiring connector from the clock.
4. Remove the two clock retaining screws and remove the clock from underneath the instrument panel. Use care, as the clock hands are unprotected.
5. **Carefully** position the replacement clock to the instrument panel and install the two retaining screws.
6. Connect the clock wiring connector to the clock.
7. Install the clock set knob and set the clock.
8. Connect the battery ground cable to the battery.

ELECTRIC CLOCK—FALCON

1. Disconnect the battery ground cable from the battery.
2. From underneath the instrument panel, disconnect the clock wire connectors (blue and blue-red wires).
3. Remove the nut and washer with spacer assembly which retains the clock to the instrument panel.
4. Pull the clock wires through the instrument panel and remove the clock.
5. Position the replacement clock to the instrument panel and route the clock wires through the instrument panel.
6. Install the spacer, nut and washer assembly which retains the clock to the instrument panel.
7. Connect the clock wiring connectors.
8. Connect the battery ground cable to the battery.

ELECTRIC CLOCK—MERCURY INTERMEDIATE

1. Disconnect the battery ground cable.
2. Remove the clock reset knob (one screw).
3. Disconnect the clock wire and light socket.
4. Remove the clock retaining screws and remove the clock.
5. Position the new clock and install the retaining screws.
6. Install the light socket and wire lead.
7. Install the reset knob, connect the battery cable, set the clock and check its operation.

TURN SIGNAL FLASHER UNIT—MUSTANG

1. If equipped with air conditioning, remove the three ash tray retaining screws and remove the ash tray to provide access.
2. Push in and twist the flasher unit, then pull outward.
3. Disconnect the flasher wiring leads from the flasher and remove the flasher.
4. Connect the wiring leads to the flasher. Position the flasher and push in with a twisting motion to lock it in place.
5. Install the ash tray if removed.
6. Check turn signals for proper operation.

TURN SIGNAL FLASHER UNIT—FALCON, FAIRLANE AND MERCURY INTERMEDIATE

1. Reaching behind the instrument panel, push in and twist the flasher unit; then, pull outward.
2. Disconnect the flasher wiring leads from the flasher and remove the flasher unit.
3. Connect the flasher wiring leads to the flasher. Position the flasher and push in with a twisting motion to lock it in place.
4. Check turn signals for proper operation.

SEQUENTIAL TURN SIGNAL RELAY AND/OR FLASHER—COUGAR

1. Open the luggage compartment door.
2. Fold back the floor mat and from over the left quarter well remove the retaining screws from the left quarter panel well cover and remove the panel.
3. Disconnect five multiple wiring connectors and remove the relay assembly from its two retaining hooks in the quarter panel.
4. Carefully unwrap or cut the sound deadening insulation from around the relay assembly.
5. Remove two screws and nuts and remove the relay or flasher assembly from its rubber mounting pad.
6. Position the new relay or flasher to the mounting pad and install the retaining screws and nuts.
7. Position the sound deadner insulation around the assembly and wrap it with tape.
8. Connect the five multiple wiring connectors and position the relay assembly on the hooks in the quarter panel.
9. Check turn signals for proper operation.
10. Install the quarter panel well cover and floor mat.

EMERGENCY WARNING FLASHER—EXCEPT COUGAR

Pull the flasher unit from the retaining clip, and disconnect the wire. Refer to Group 19 for location of the flasher unit.

SPEEDOMETER—MERCURY INTERMEDIATE

REMOVAL

1. Disconnect the battery ground cable from the battery.
2. Remove the clock set knob.
3. Cover the steering column to prevent paint damage.
4. Remove the eight instrument cluster retaining screws.
5. Position the instrument cluster outward. Disconnect the clock wire, speedometer cable, two warning light bulbs and the main wiring connector. Remove the instrument cluster assembly.
6. Remove the ten screws which retain the rear cluster cover to the cluster housing and remove the cluster rear cover.
7. Remove the two speedometer retaining screws and remove the speedometer.

INSTALLATION

1. Position the speedometer and install the two retaining screws.
2. Position the cluster rear housing assembly to cluster housing and install the ten retaining screws.
3. Install the clock set knob.
4. Position the cluster assembly at the instrument panel opening. Connect the clock, main wiring connector and the speedometer cable.
5. Position the cluster assembly in the instrument panel and install the eight cluster assembly retaining screws.
6. Connect the battery ground cable to the battery.
7. Check the operation of the instruments and controls.

SPEEDOMETER—MUSTANG COUGAR AND COUGAR XR-7

1. Disconnect the battery ground cable from the battery.
2. Remove the instrument cluster assembly. Remove the trip reset knob (if so equipped).
3. Remove the nine rear cluster housing retaining screws and remove the rear cluster housing and gauges.
4. Remove the two speedometer retaining screws and remove the speedometer from the rear cluster housing.
5. Position the speedometer in the rear cluster housing and install the two retaining screws.
6. Position the rear cluster housing to the cluster and install the nine retaining screws.
7. Install the instrument cluster in the instrument panel. Install the trip reset knob (if so equipped).

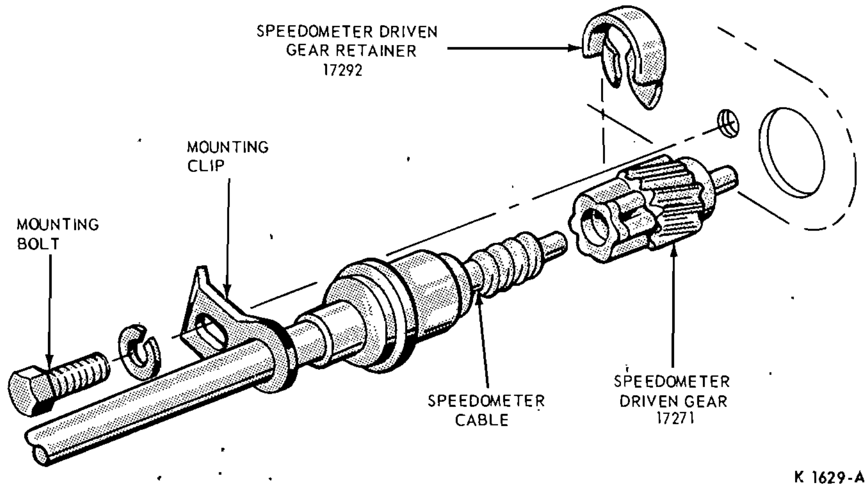


FIG. 15—Speedometer Driven Gear Retainer and Mounting

8. Check speedometer operation.

SPEEDOMETER—FAIRLANE

1. Disconnect the battery ground cable.
2. Remove the radio knobs, mounting nuts, and radio.
3. Disconnect the speedometer cable.
4. Remove the screws retaining the cluster assembly to the instrument panel. Position the cluster assembly outward.
5. Disconnect the bulbs, constant voltage regulator and its ground wire, the clock and the fuel gauge.
6. Remove the cluster assembly to a bench.
7. Remove the clock knob and the screws retaining the rear cluster cover. The cover retains the speedometer, clock, fuel gauge, the bulbs for the alternator charge indicator, oil pressure, and the hot and cold engine temperature indicators.
8. Remove the screws retaining the speedometer head to the cover and the four rubber insulators. Remove the speedometer head.
9. Position the speedometer and install the retaining screws at the rear. Install the four rubber insulators.
10. Position the rear cover assembly to the front of the cluster. Install the retaining screws. Install the clock knob.
11. Position the cluster assembly. Connect all leads and bulbs.
12. Position the cluster assembly to the instrument panel. Install the retaining screws.
13. Position the radio to the cluster and install the mounting nuts and knobs.
14. Connect the speedometer cable.
15. Connect the battery ground cable and check the operation of the disconnected parts.

SPEEDOMETER—FALCON

1. Disconnect the battery ground cable.
2. Disconnect the speedometer cable.
3. Remove the instrument cluster assembly.
4. Remove the six screws retaining the instrument cluster back plate assembly and remove the back plate assembly.
5. Remove the two screws retaining the speedometer, the two screws retaining the speedometer dial to the back plate, and remove the speedometer assembly.
6. Position the speedometer and install the two speedometer dial retaining screws and the two speedometer retaining screws.
7. Position the back plate assembly and install the six retaining screws.
8. Install the instrument cluster assembly to the instrument panel.
9. Connect the speedometer cable, avoiding sharp bends.
10. Connect the battery ground cable.

SPEEDOMETER CABLE

To replace the speedometer drive cable, disconnect the cable housing from the speedometer, and pull the cable out of the housing. Wipe off all of the old lubricant. Lubricate the new cable with cable lubricant B5AZ-19581-A (do not over lubricate), insert it all the way into the housing, and twist it slightly to make sure that the squared drive is

engaged in the speedometer driven gear. **If a speedometer cable is broken, it will be necessary to disconnect both ends of the cable housing in order to remove the broken sections. Tighten the mounting bolt to 3-4 1/2 foot-pounds torque (Fig. 15).**

The speedometer driven gear is held on to the speedometer cable housing by a retainer clip. When replacing the driven gear, make certain that the gear is secure by placing the gear in position before inserting the retainer clip through the gear slots.

TACHOMETER—MERCURY INTERMEDIATE

1. Disconnect the battery ground cable.
2. Remove the eight retaining screws from the cluster and position the cluster assembly out.
3. Disconnect the tachometer, speedometer cable and the park and seat belt bulbs.
4. Disconnect the multiple conconnector and remove the cluster assembly.
5. Remove the two retaining screws from the tachometer and remove the tachometer from the cluster.
6. Position the tachometer to the cluster and install the retaining screws.
7. Connect the tachometer, speedometer cable and park and seat belt bulbs. Also, connect the multiple connector.
8. Position the cluster to the instrument panel and install the eight retaining screws.
9. Connect the battery ground cable and check the operation of the tachometer.

TACHOMETER—MUSTANG AND COUGAR XR-7

1. Disconnect the battery ground cable from the battery.
2. Remove the instrument cluster assembly (Refer to Part 4).
3. Remove the nine rear cluster housing retaining screws and remove the rear cluster housing and gauges.
4. Remove the two tachometer retaining nuts and remove the speedometer from the rear cluster housing.
5. Position the tachometer in the rear cluster housing and install the two retaining nuts.
6. Position the rear cluster housing to the cluster and install the nine retaining screws.
7. Install the instrument cluster in the instrument panel.
8. Check tachometer operation.

WINDSHIELD WIPER MOTOR—FALCON, FAIRLANE AND MERCURY INTERMEDIATE

1. Disconnect the wiper motor wiring connector.
2. Remove the wiper arm and blade assemblies.
3. Remove the cowl top grille panel retaining screws and remove the cowl top grille.
4. Remove the wiper link retaining clip from the wiper motor arm.
5. Remove the four wiper motor retaining bolts and remove the wiper motor and mounting bracket.
6. Transfer the wiper motor mounting bracket and related parts to the replacement wiper motor.
7. Position the wiper motor and mounting bracket to the dash panel and install the four retaining bolts.
8. Position the wiper link on the motor drive arm and install the retaining clip.
9. Install the cowl top grille panel.
10. Connect the wiper motor wiring connectors.
11. Check the wiper motor operation.
12. Install the wiper arm and blade assemblies.

WINDSHIELD WIPER MOTOR—MUSTANG AND COUGAR

1. Disconnect the battery ground cable.
2. Remove the courtesy light. If the vehicle is equipped with a hang on air conditioner, lower the air conditioner to the floor.
3. Disconnect the wiper motor plug connector.
4. Remove the nut retaining the pivot arm and wiper arms to the motor.
5. Remove the bolts and star washers retaining the motor to the mounting bracket, and remove the motor.
6. Position the flat washers to the motor, position the motor to the mounting bracket and install the retaining bolts and star washers.
7. Position the pivot arm and wiper arms to the motor, and install the retaining nut.
8. Connect the motor wire plug, connect the battery, check the motor operation, and install the courtesy light.

WINDSHIELD WIPER PIVOT SHAFT AND LINK—FALCON, FAIRLANE AND MERCURY INTERMEDIATE

1. Remove the wiper arms and blades.
2. Remove the cowl top grille panel retaining screws and remove the cowl top grille panel.
3. Remove the drive arm to pivot retaining clip.
4. Remove the three retaining screws from each pivot and remove the pivot shaft and link assembly.
5. Transfer the right pivot if necessary (the left pivot is part of the link assembly).
6. Position the pivot shaft and link assembly in the cowl and install the pivot shaft retaining screws.
7. Position the left link on the motor drive arm and install the retaining clip.
8. Install the wiper arms and blades.
9. Check the wiper operation.
10. Install the cowl top grille panel.

WINDSHIELD WIPER PIVOT SHAFT AND LINK—MUSTANG AND COUGAR

LEFT SIDE

1. Disconnect the battery ground cable from the battery.
2. Remove the wiper arm and blade assembly.
3. Remove the four screws which retain the heater control to the instrument panel and position the heater control outward.
4. Remove the clip which retains the link to the motor drive.
5. Working through the heater control opening, remove the three pivot shaft retaining bolts. Remove the pivot and link out through the heater control opening.
6. Install a new gasket on the pivot. Position the pivot through the heater control opening and install the three retaining bolts.
7. Install the clip which retains the link to the motor drive.
8. Install the heater control assembly.
9. Install the arm and blade assembly.

RIGHT SIDE

1. Disconnect the battery ground cable from the battery.
2. Remove the wiper arm and blade assembly.
3. Remove the glove box liner retaining screws and remove the glove box liner.
4. Working through the glove box opening, remove the three bolts which retain the pivot assembly to the cowl panel. Remove the clip which retains the link to the wiper motor drive and

remove the pivot and link assembly out through the glove box opening.

5. Install a new gasket on the pivot. Position the pivot and link assembly through the glove box opening and install the three pivot retaining bolts. Install the link retaining clip on the wiper motor drive.

6. Install the glove box liner.

7. Connect the battery ground cable on the battery.

8. Install the wiper arm and blade asembly.

WINDSHIELD WASHER PUMP—FALCON, FAIRLANE AND MERCURY INTERMEDIATE

1. Disconnect the washer pump wiring connectors.

2. Remove the inlet and outlet hoses from the washer pump. Position the inlet hose upward to prevent draining the washer reservoir.

3. Remove the two screws which retain the washer pump to the fender apron and remove the washer pump.

4. Position the washer pump to the fender apron and install the two retaining screws.

5. Connect the inlet and outlet hoses to the washer pump.

6. Connect the washer pump wiring connectors.

5 MAJOR REPAIR OPERATIONS

WIPER MOTOR DISASSEMBLY

1. Remove the gear cover retaining screws, ground terminal and cover (Fig. 16).

2. Remove the gear and pinion retainer.

3. Remove the idler gear and pinion and thrust washer.

4. Remove the motor through bolts, motor housing, switch terminal insulator sleeve, and armature. **Do not pound the motor housing magnet assembly as the ceramic magnets may be damaged.**

5. Mark the position of the output arm with respect to the output shaft, for assembly. Remove the output arm retaining nut, output arm, spring washer, flat washer, output gearshaft assembly, thrust washer, and parking switch lever and parking switch lever washer.

6. Remove the brushes and brush springs.

7. Remove the brush plate and switch assembly, and remove the switch contact to parking lever pin from the gear housing.

PARTS REPAIR OR REPLACEMENT

All parts on both the single-speed and two-speed wiper are replaced and not repaired.

WIPER MOTOR ASSEMBLY

1. Install the parking switch lever washer.

2. Install the parking switch lever on the gear and pinion shaft with the cam rider pointing toward the gear housing output shaft hole. Make certain that the lever bottoms against the casting.

3. Apply a film of Sun Prestige grease to the output gear teeth and shaft bearing surface. Insert the shaft in the bearing. Make certain that the parking switch lever is clear of the cam and gear assembly.

4. Place the spacer washer and spring washer on the shaft, position the output arm on the shaft in the

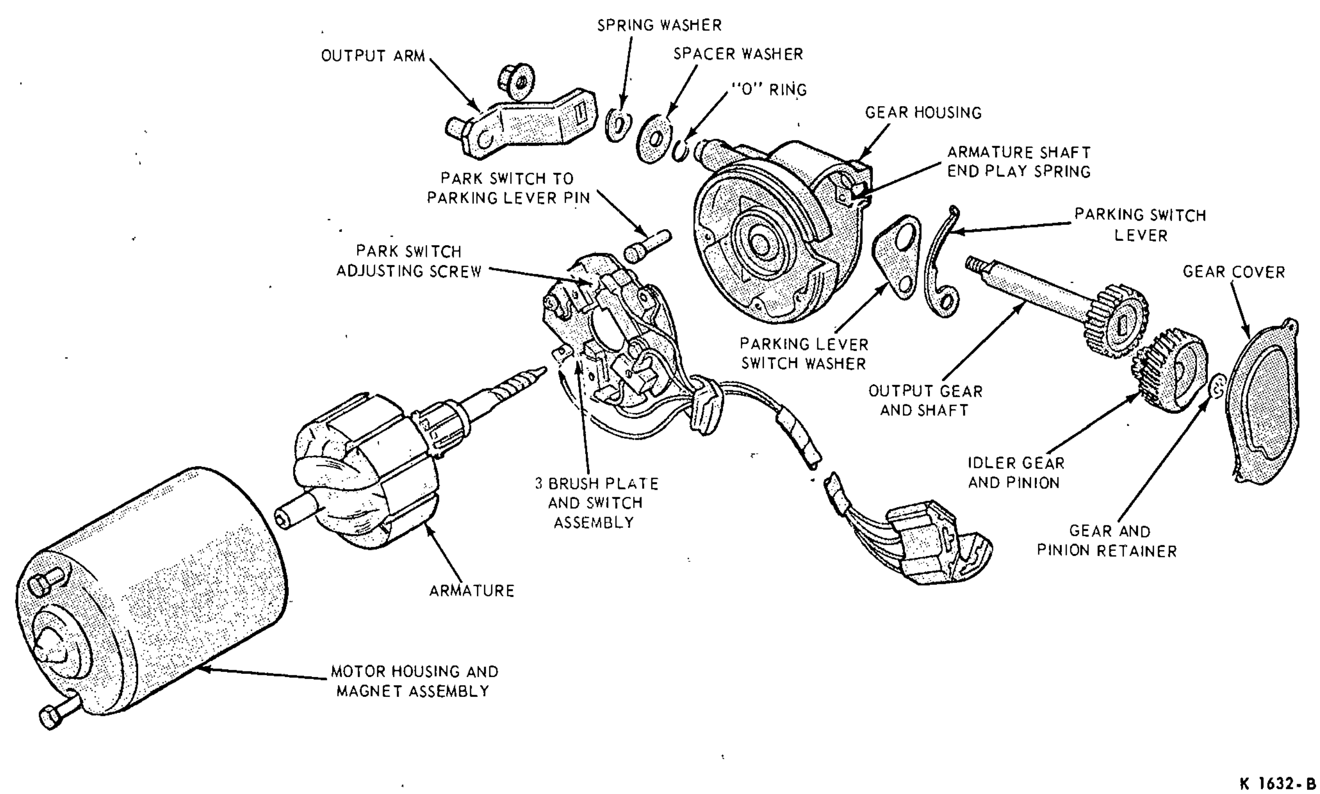


FIG. 16—Disassembled Wiper Motor

marked position from which it was removed, and install the mounting nut.

5. Position the brush springs and brushes in the holders and wrap wire around them to hold them in the fully retracted position. Push the insulated brush connector onto the switch terminal.

6. Place the switch-contact to parking-lever pin in the gear housing. Position the brush plate assembly to the housing and install the mounting screws.

Make the park switch contact points adjustment covered under Wiper Motor Park Switch Test and Adjustment in Section 1.

7. Apply Sun Prestige grease to the ball bearing in the end of the armature shaft. Position the armature shaft in the gear housing and remove the brush retracting wires.

8. Holding the armature in position, install the terminal insulating sleeve, motor housing and magnet assembly, and through bolts. Seal the area where the terminal insulator sleeve seats against the motor and gear housings.

9. Apply Sun Prestige grease to the worm gear and idler gear, and install the idler gear, thrust washer and retainer.

10. Apply a generous amount of Sun Prestige grease to the area around the end of the armature shaft. Install the gear housing cover and ground terminal.

ELECTRO-PNEUMATIC GOVERNOR AND CONTROL SELECTOR SWITCH—MERCURY INTERMEDIATE

The electro-pneumatic governor and the control selector switch are serviced as assemblies only. Should any internal component become defective the complete assembly must be replaced.

In the event of suspected partial or total blockage of internal passages, light air pressure may be applied in an attempt to remove the cause of blockage.

Although the vacuum hoses are an integral part of the wiring harness assembly, individual hoses may be replaced if required.

PART 15-5—Specifications

MERCURY INTERMEDIATE, FALCON, FAIRLANE, AND MUSTANG — BULB CHART

Light Description	Mercury Intermediate		Falcon		Fairlane		Mustang	
	Bulb No.	Candela or Wattage	Bulb No.	Candela or Wattage	Bulb No.	Candela or Wattage	Bulb No.	Candela or Wattage
Ash Receptacle or Cigar Lightor					1445	1.5C.	1895	2C.
Backup Lights—Sedan	1156	32C.	1156	32C.	1156	32C.	1142	21C.
Station Wagon	1156	32C.	1076	32C.	1156	32C.	—	—
Courtesy Lamp (Console)							1895	2C.
(Convertible and Inst. Panel	631	6C.	631	6C.	631	6C.	631	6C.
(Door Mounting or Armrest)	631	6C.	—	—	631	6C.	1004 ②	15C.
Cargo Lamp (Station Wagon)	1003	15C.	1003	15C.	1003	15C.	—	—
Dome Lamp	1003	15C.	1003	15C.	1003	15C.	1003	15C.
Engine Compartment	631	6C.	631	6C.	631	6C.	631	6C.
Glove Compartment or Console	1895	2C.	1895	2C.	1895	2C.	1445	1.5C.
Headlamps Hi-Lo Beam (Outer or Upper)	4002	37.5-50W	6012	40-50W	4002	37.5-50W	6012 ①	40-50W
Hi Beam (Inner or Lower)	4001	37.5W	—	—	4001	37.5W	—	—
License Lamp	97	4C.	97	4C.	97	4C.	97	4C.
Luggage Compartment	631	6C.	631	6C.	631	6C.	631	6C.
Map Light	631	6C.	631	6C.	631	6C.	631	6C.
Park and Turn Signal Lamp	1157-A	4-32C.	1157	4-32C.	1157	4-32C.	1157-A	4-32C.
Spotlight (4.4 in. dia.)	4405	30W	4405	30W	4405	30W	4405	30W
Taillight, Stop and Turn Signal Lamp	1157	4-32C.	1157	4-32C.	1157	4-32C.	1157	4-32C.

1 Fog Light 4415 (35W)
2 Fastback 1004 15C. for Door Mounted Light

MERCURY INTERMEDIATE, FALCON, FAIRLANE, AND MUSTANG — BULB CHART (Continued)

Light Description	Mercury Intermediate		Falcon		Fairlane		Mustang	
	Bulb No.	Candela or Wattage	Bulb No.	Candela or Wattage	Bulb No.	Candela or Wattage	Bulb No.	Candela or Wattage
Instrument Panel Illumination								
Clock & Ignition Key	1895	2C.	1816	3C.	1895	2C.	1895 ①	2C.
Control Nomenclature	1895	2C.	1895	2C.	1895	2C.	1895	2C.
Gages and Speedometer	1895	2C.	1895	2C.	1895	2C.	1895	2C.
Radio Dial Light	1893	1.9C.	1445	1.5C.	1895	2C.	1893	1.9C.
Tachometer	1895	2C.	1895	2C.	1895	2C.	1895	2C.
Trans Control Selector Indicator	1445	1.5C.	1445	1.5C.	1445	1.5C.	1445	1.5C.
③ Turn Signal Indicators (L and R)	1895	2C.	1895	2C.	1895	2C.	1895	2C.
Warning Lights, Panel or Lamp Kits								
Emergency Flasher	1895	2C.	1895	2C.	1895	2C.	1895	2C.
Hi-Beam Indictator	1895	2C.	1895	2C.	1895	2C.	1895	2C.
Oil Press., Alt., and Temp Warning	1895	2C.	1895	2C.	1895	2C.	1895	2C.
Parking Brake Warning	1895	2C.	1895	2C.	1895	2C.	257	1.6C.
Seat Belt Warning	1895	2C.	1895	2C ②	257	1.6C.	1891	2C.

① 1816 (3C.) For Rally PAC ② R.P.O. ③ 1895G Bulb for States of Minnesota and Wisconsin

COUGAR BULB CHART

Light Description	Bulb No.	Candela or Wattage
Headlight-Hi-lo Beam (Outer)	4002	37.5 & 50 Watts
Headlight-Hi Beam (Inner)	4001	37.5 Watts
Front Parking and Turn Signal	1157A	4-32C.
Rear and Stop and Turn Signal	1157	4-32C.
License Plate	97	4C.
Map Light	631	6C.
"C" Pillar Light	1003	15C.
Auto-Trans. Quadrant	158	2C.
Turn Signal Indicator	53X	1C.
Door Courtesy	1816	3C.
Luggage Compartment	631	6C.
Glove Compartment	631	6C.
Back-up Light	1156	32C.
Dome	1816	3C.
Speedometer	1445	1.5C.

Light Description	Bulb No.	Candela or Wattage
Gages	1895	2C.
Hi-Beam	1895	2C.
Turn Signal	1895	2C.
Clock	1895	2C.
ⓘ Turn Signal Indicator	1895-G	2C.
Courtesy Light	631	6C.
Hand Brake Signal	1895	2C.
Radio AM	1893	1.9C.
Spotlight	4405	30 Watts
Console Light	1816	3C.
Low Fuel Warning	1445	1.5C.
Emergency Flasher Warning	1445	1.5C.
Door Lock Warning	256	1.6C.
Seat Belt Warning	1445	1.5C.
ⓘ For States of Minnesota and Wisconsin		

CIRCUIT PROTECTION — MERCURY INTERMEDIATE, FALCON, FAIRLANE, COUGAR AND MUSTANG

Fuse Panel Circuits	Protective Device — Fuses in Amperes				
	Mercury Intermediate	Falcon	Fairlane	Cougar	Mustang
Ash Tray Light	AGA-2.5	AGA-2.5	AGA-2.5	AGA-2.5	AGA-2.5
Back Up Light	SFE-14	SFE-14	SFE-14	SFE-14	SFE-14
Cargo Light	SFE-7.5	SFE-7.5	SFE-7.5	SFE-7.5	SFE-7.5
Cigar Lighter	SFE-20	SFE-20	SFE-20	SFE-20	SFE-20
Clock	SFE-20	—	SFE-20	SFE-7.5	SFE-7.5
Clock Light	AGA-2.5	—	AGA-2.5	AGA-2.5	AGA-2.5
Courtesy Lights	SFE-7.5	SFE-7.5	SFE-7.5	SFE-7.5	SFE-7.5
Dome Lights	SFE-7.5	SFE-7.5	SFE-7.5	SFE-7.5	SFE-7.5
Door Ajar Warning (Door Open Warning, Fairlane Taxi)	—	—	SFE-7.5	SFE-14	SFE-7.5
Emergency Warning Flasher	SFE-20	SFE-20	SFE-20	SFE-14	SFE-20
Glove Box Light	SFE-7.5	SFE-7.5	SFE-7.5	SFE-7.5	SFE-7.5
Heater and Defroster	SFE-14	SFE-14	SFE-14	SFE-14	SFE-14
Instrument Panel and Cluster Lights	AGA-2.5	AGA-2.5	AGA-2.5	AGA-2.5	AGA-2.5
Luggage Compartment Light	SFE-7.5	SFE-7.5	SFE-7.5	SFE-7.5	SFE-7.5
Map Light	SFE-7.5	SFE-7.5	SFE-7.5	SFE-7.5	SFE-7.5
Radio	SFE-14	SFE-14	SFE-14	SFE-14	SFE-14
Radio Light	AGA-2.5	AGA-2.5	AGA-2.5	AGA-2.5	AGA-2.5
Seat Belt Warning Light (Inst. or Safety Conv. Panel)	SFE-14	SFE-14	SFE-14	SFE-7.5	SFE-7.5
Seat Belt Warning — Cougar Model 65B Only	—	—	—	SFE-14	—
Tachometer Light	AGA-2.5	—	AGA-2.5	AGA-2.5	AGA-2.5
Transmission Selector Light	AGA-2.5	AGA-2.5	AGA-2.5	SFE-14	SFE-14
Turn Signals	SFE-14	SFE-14	SFE-14	SFE-14	SFE-14
Windshied Washers	SFE-14	SFE-14	SFE-14	—	—

CIRCUIT PROTECTION —MERCURY INTERMEDIATE, FALCON, FAIRLANE, COUGAR AND MUSTANG (Continued)

Miscellaneous Circuits	Location	Protective Device—Fuse or Circuit Breaker (C.B.) in Amperes				
		Mercury Intermediate	Falcon	Fairlane	Cougar	Mustang
Headlights	In Headlight Switch	18 C.B.	12 C.B.	18 C.B.	18 C.B.	12 C.B.
Tail Lights, Stop Lights, License Lights, Parking Lights and Horns	In Headlight Switch	15 C.B.	15 C.B.	15 C.B.	15 C.B.	15 C.B.
Tail Lights (Cougar)	Near Left Rear Light Assy.	—	—	—	5 C.B.	—
Emergency Warning Flasher	Windshield Wiper Bracket	—	—	—	15 C.B.	—
Windshield Wipers	Windshield Wiper Switch	6 C.B.	6 C.B.	6 C.B.	6 C.B.	6 C.B.
Intermittent Windshield Wipers	Windshield Wiper Switch	7 C.B.	—	—	—	—
Convertible Top	Between Starter Relay and Junction Block	Safety Link	—	Safety Link	—	Safety Link
Power Windows, Power Seats and Back Window Control	On Starter Relay	20 C.B.	20 C.B.	20 C.B.	—	—
Overdrive	Clip to Overdrive Relay	—	—	SFE-20	—	—
Air Conditioner (Integrated)	Acc. Terminal Ignition Switch	25 C.B.	25 C.B.	25 C.B.	25 C.B.	25 C.B.
Air Conditioner (Economy)	In-Line From Acc. Terminal Of Ignition Switch	AGC-15	AGC-15	AGC-15	AGC-15	AGC-15
Speed Control	In-Line From Acc. Terminal Of Ignition Switch	—	—	—	SFE-7.5	SFE-7.5
Motors: Windshield Wiper, Convertible Top, Power Windows and Power Seats	Integral Part of Motor	C.B.	C.B.	C.B.	C.B.	C.B.
Transmission Selector Light (Console)	In-Line	AGW-4	AGW-4	AGW-4	—	—
Parking Brake Warning	In-Line	AGW-4	AGW-4	AGW-4	SFE-7.5	SFE-7.5

Ventilating, Heating, And Accessories

GROUP 16

PART 16-1— *Ventilating System And Heater*

1 DESCRIPTION AND OPERATION

VENTILATING AND HEATING SYSTEM—MERCURY INTERMEDIATE, FALCON AND FAIRLANE

The 1967 heater is a blend air system connected to an opening in the right vent air duct. The entire heater assembly is located under the instrument panel (Figs. 1 and 2).

Outside air is drawn into the vehicle from the cowl through the right air duct, into the blower housing, forced through and/or around the heater core, mixed, and then discharged through the outlets in the discharge air register or defroster outlets (Figs. 3 and 4).

The air temperature is controlled by the position of the temperature air valve, or door, located between the blower and heater core in the heater housing. As the temperature lever is moved from LOW to HIGH; a Bowden cable moves the temperature door in the heater housing from minimum heat to full heat position to modulate the air flow through and/or around the heater core. The air through the core and the air through the bypass chamber is then mixed as it enters the plenum chamber.

A heater air valve, referred to as the heat-defrost door, is located in the plenum chamber to control the discharge air between heat and defrost, and close off all air in the OFF position. The heat-defrost lever actuates a Bowden cable connected to the heater air valve in the plenum chamber. Air flow through the plenum is directed, as required by the operator, through the discharge air

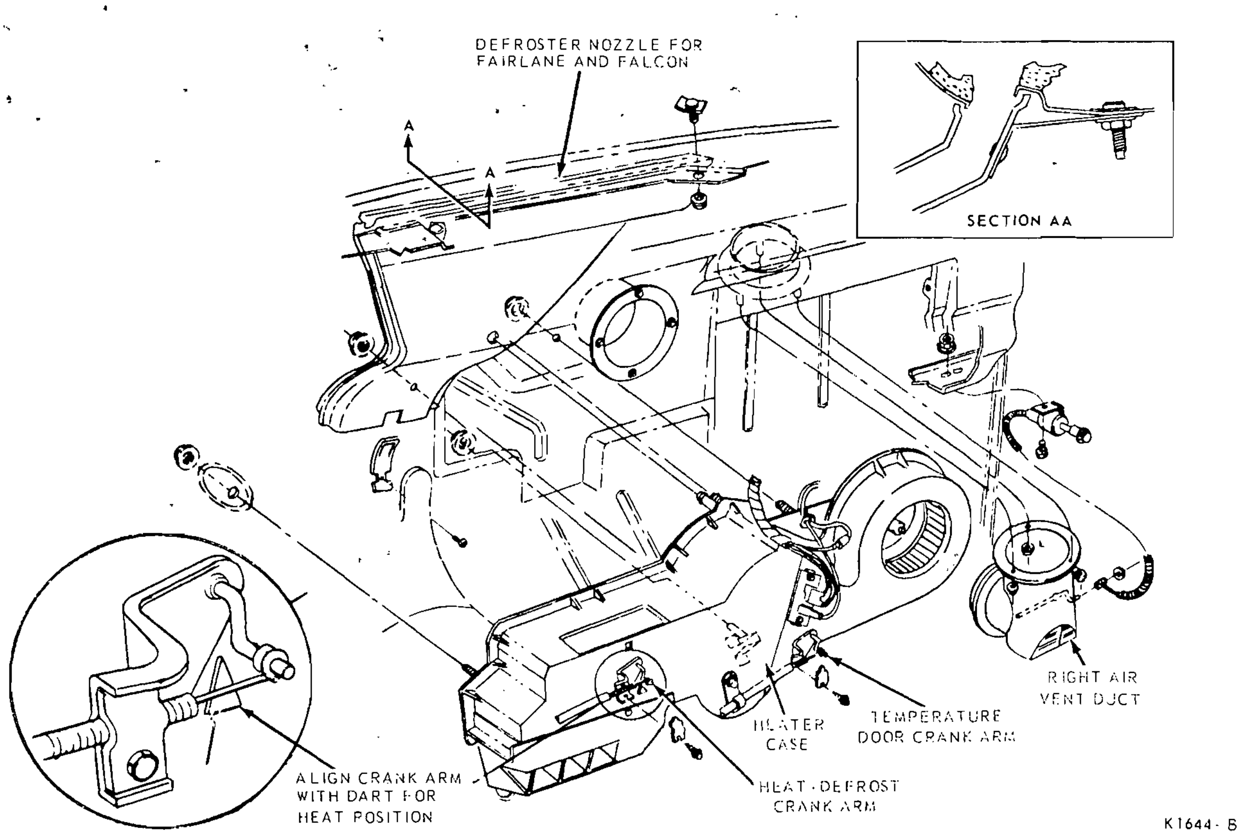


FIG. 1—Heater Assembly—Mercury Intermediate, Falcon and Fairlane

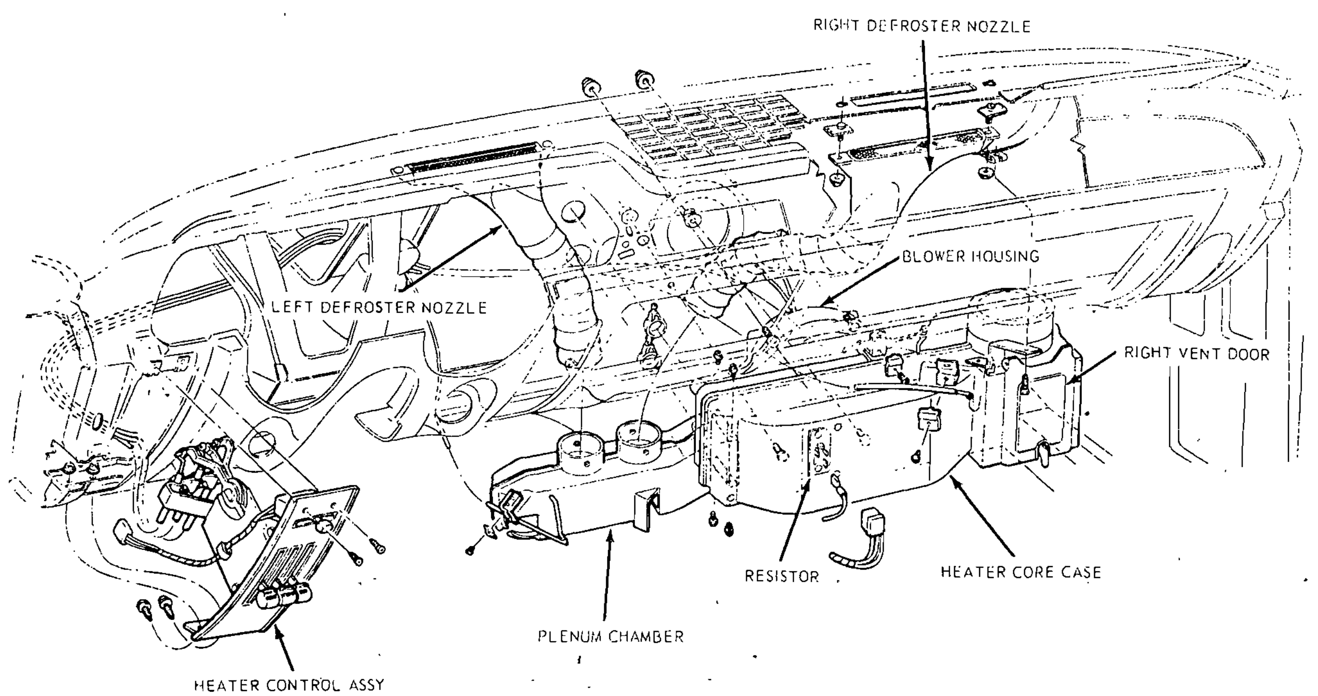


FIG. 2—Heater Assembly—Cougar, Mustang

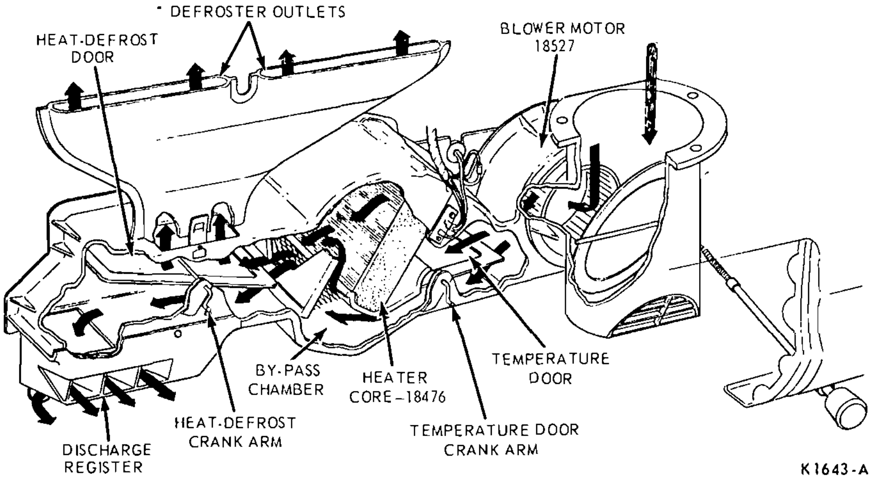


FIG. 3— Heater Air Flow (Modulated)—Mercury Intermediate, Falcon and Fairlane

outlets in the plenum, in the heat position; or up to the windshield in the defrost position. The air flow can also be modulated by setting the controls in any position between heat and defrost.

A single defroster nozzle leads to two slots in the forward instrument panel crash pad.

Three speeds are provided for the blower fan with a four position switch in the control assembly and a resistor assembly located in the heater housing. The resistor in the blower motor circuit controls the low and medium blower speeds.

The nomenclature for the Fairlane heater controls is located on the lower right side of the instrument cluster, and the horizontal control levers are directly below on the lower lip of the instrument panel (Fig. 5).

The Falcon control, located on the right side of the cluster assembly, contains two vertical slide levers and the blower switch (Fig. 6).

The Mercury Intermediate heater controls are located to the left of the steering column in the lower instrument panel area. The dials for the Caliente and Cyclone models are illuminated with one bulb; the Capri and 202 model does not have an illuminated dial (Fig. 7).

In order to provide adequate air distribution on all vehicles, two air distribution register assemblies are provided. All vehicles equipped with consoles or economy air conditioning is equipped with a register that distributes the air to the left and right of the tunnel area. The register for standard vehicles has air outlets across the face of the register and a small outlet on the lower left end.

VENTILATING AND HEATING SYSTEM—COUGAR AND MUSTANG

VENTILATING SYSTEM

Two manually operated doors located under each end of the instrument panel allow fresh air to enter the passenger compartment. The right door is open to the cowl inlet only when the HEAT lever is in the up position. The position of the fresh air doors deflects the air as desired.

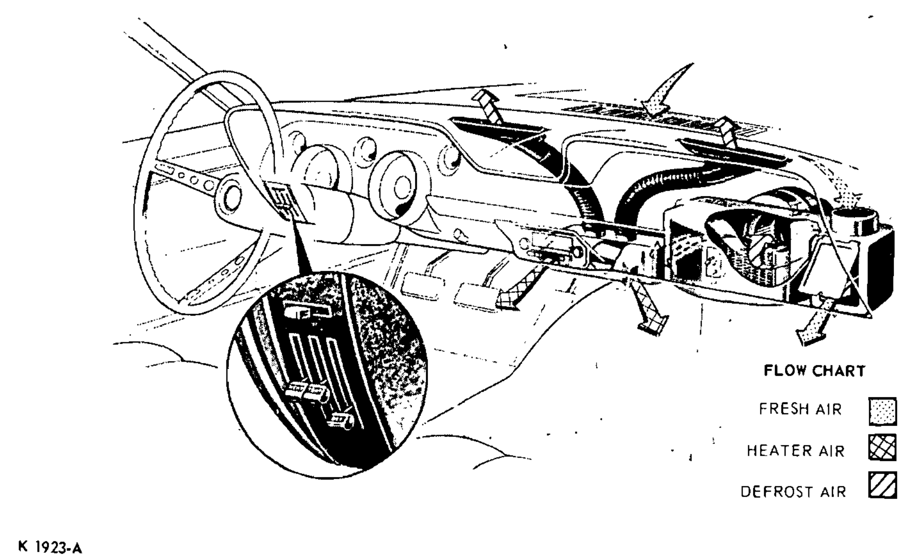


FIG. 4— Heater Air Flow—Cougar, Mustang

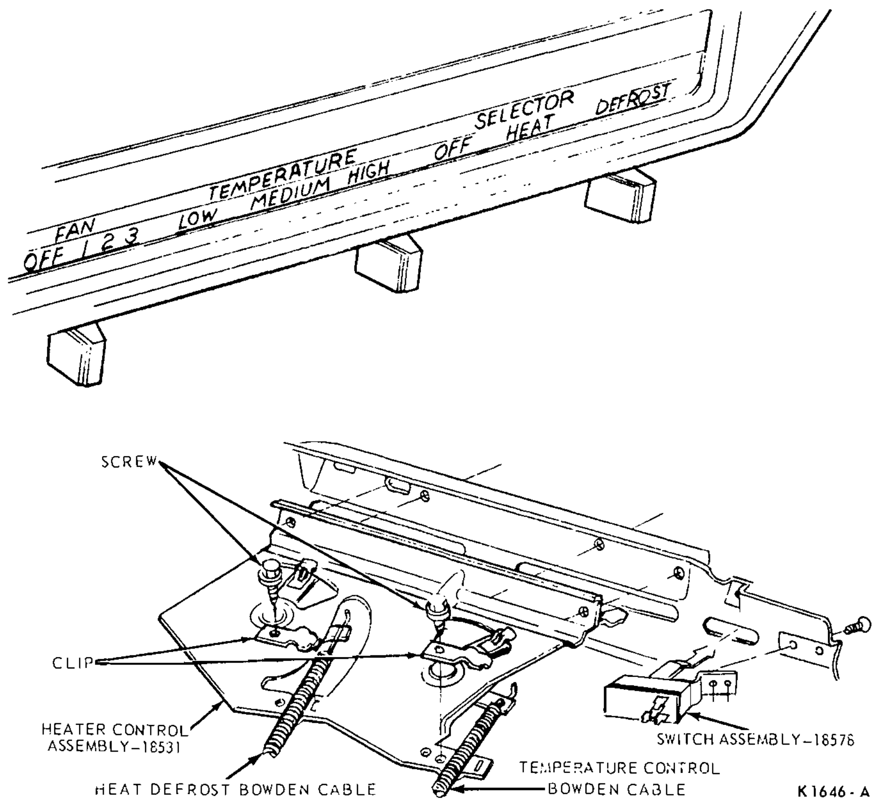


FIG. 5—Heater Controls—Fairlane

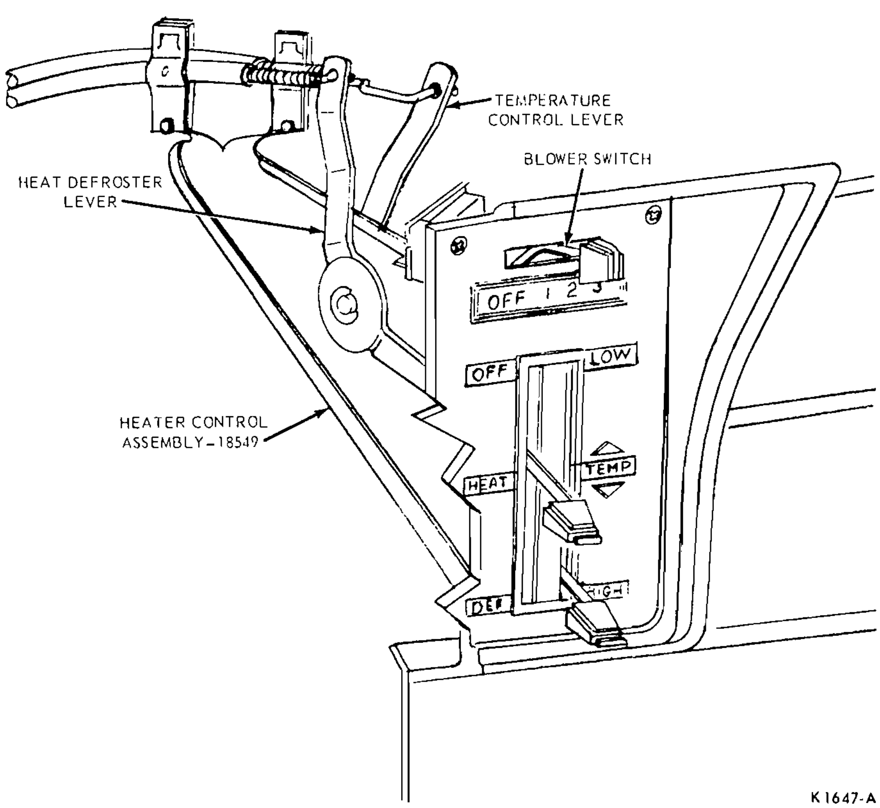


FIG. 6—Heater Controls—Falcon

HEATING SYSTEM

The fresh air heater is designed to function in conjunction with the right duct of the fresh air ventilating system. The heater assembly couples to an outlet provided in the right cowl assembly. A door in the duct and two doors in the heater housing are operated by controls located on the instrument panel, allowing the selection of outside air for ventilation or heating (Figs. 8 and 9).

The defroster control lever operates a valve in the heater plenum chamber. Push the lever downward for proportionately more air to the defroster registers.

The TEMP lever operates the blend-air valve in the heater blower housing. The blend-air door controls the amount of air flow through the heater core. Any intermediate position of the blend-air door allows both cool and heated air to be mixed in the plenum chamber for lower than maximum temperatures.

The HTR lever operates a door in the right incoming air duct. When the lever is in the up position air from the cowl grille enters the passenger compartment through an opening under the right side of the instrument panel. A manually operated door closes the opening, or deflects air as desired. Pushing the lever downward allows air to enter the heater blower chamber.

To operate the blower motor, move the top lever from the center OFF position. Moving the lever to the left will give high speed operation, and moving it to the right will give low speed operation (Fig. 4).

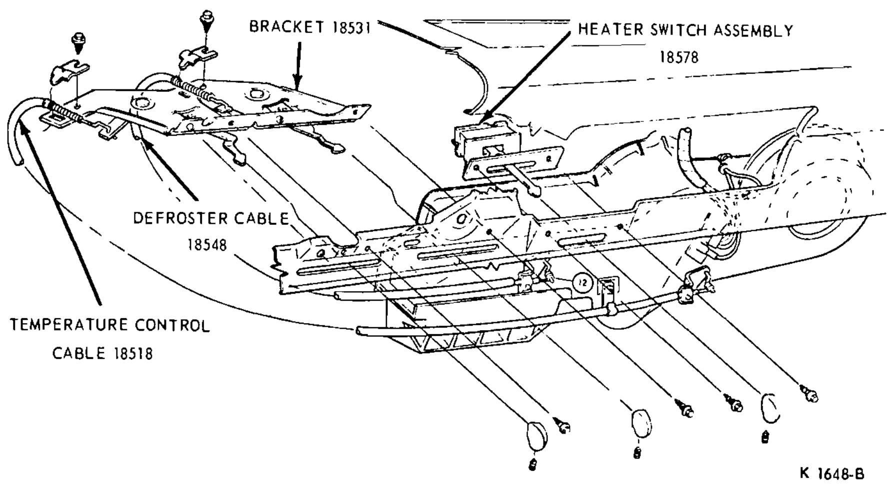


FIG. 7—Heater Controls—Mercury Intermediate

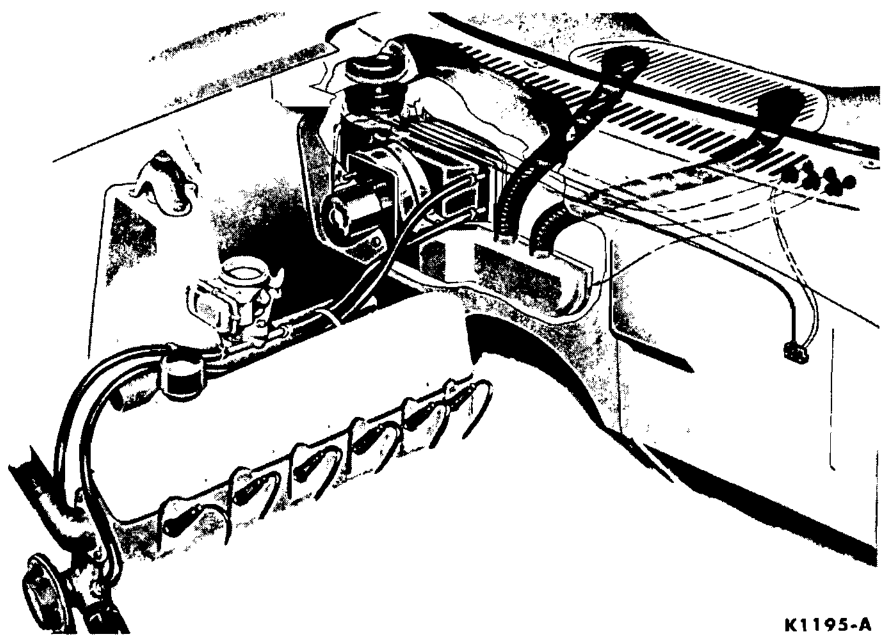


FIG. 8—Heater System—Mustang, Cougar

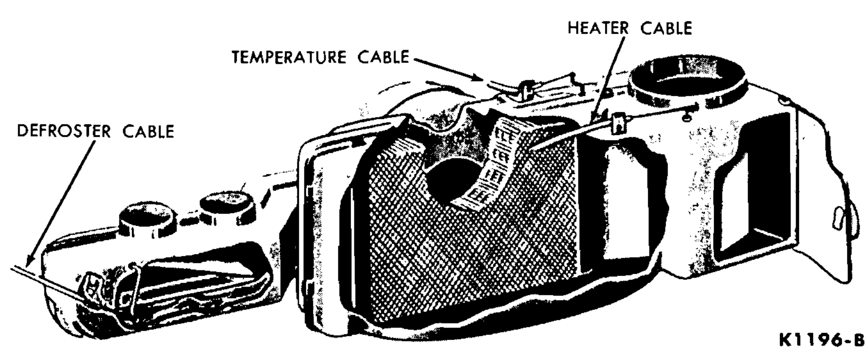


FIG. 9—Heater Control Cables—Mustang, Cougar

2 DIAGNOSIS AND TESTING

DIAGNOSIS

Refer to Fig. 14 for ventilating and heating trouble diagnosis.

TESTING

Refer to Wiring Diagram Manual Form 7795P-67 for locations of wiring harnesses. Schematics are shown in Group 19 of this manual.

The following tests may be made on the heater: Burned out fuses, loose wire connections, defective wires, collapsed hoses, loose defroster hoses and air leaks in the body may be determined by visual inspection of the parts.

HEATER CURRENT DRAW TEST

This test will determine if the blower motor is defective. Connect a 0-50 ammeter as shown in Fig. 10. The blower motor will operate independently of the control switch, and the current drawn by the motor will be indicated on the ammeter.

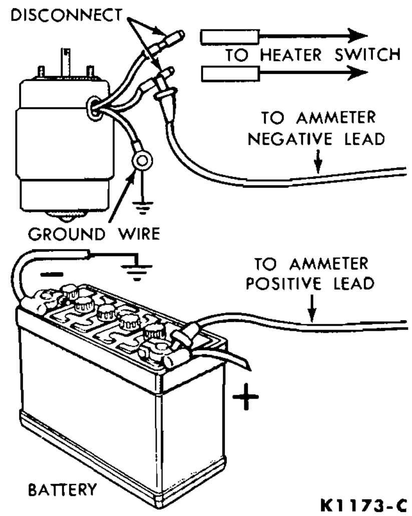


FIG. 10—Heater Motor Current Draw Test

Current draw should be to specification.

LOOSE MOTOR FAN TEST

Turn on the heater switch, and listen for the sound of the motor. If only a hum is heard, the fan is loose on the motor shaft.

BLOWER SWITCH TEST

To check the blower switch, place the switch in the off position. Then using a self-powered test light or ohm meter, check for continuity between all of the terminals, two at a time. If the light should go on, this will indicate a short between the terminals, or a defective switch.

PLUGGED HEATER CORE TEST

Start the engine and temporarily remove the outlet hose from the heater core (the hose that leads to the water pump). Very little or no flow of water from the core outlet indicates that the core is plugged. Make certain that water is being supplied to the core inlet.

3 COMMON ADJUSTMENTS AND REPAIRS

VENTILATING SYSTEM

Bowden cable operated vents and air inlets are adjusted so that the vents are tightly closed when the control knobs are all the way in. Loosen the Bowden cable retaining screw at the vent control arm; move the cable housing back and forth until the vent is closed when the knob is 1/16 to 1/8 inch from the in position, then tighten the retaining screws.

HEATING SYSTEM

CONTROL ADJUSTMENTS—COUGAR, MUSTANG

To assure maximum temperature the following temperature control adjustments should be used.

1. Insert a 1/8-inch spacer between the temperature control lever (center lever) and the bottom of the slot. Move the lever down until it is seated against the spacer.
2. Loosen the control cable retaining clip (at heater end of the cable).
3. With the temperature control damper crank (heater assembly) held tightly in the full heat position, tighten the control cable retaining clip screw.
4. Remove the spacer from the control head and check the lever travel. All overtravel (springback) should appear at the bottom of the lever travel.

BOWDEN CABLE ADJUSTMENTS—MERCURY INTERMEDIATE, FALCON AND FAIRLANE

Temperature

Adjust the temperature Bowden cable at the heater case (Fig. 1), with the temperature door crank arm in the far left position and the temperature control lever on HI. Provide approximately 1/8 inch clearance between the lever and edge of the slot for proper adjustment.

Heat and Defrost

Adjust the heat-defrost Bowden cable at the heater case by aligning the crank arm (Fig. 1), with the locating dart directly below the crank arm on the case. With the crank arm in this position, the heat-defrost door is in a horizontal position for maximum heat.

The Bowden cables can also be adjusted at the control assembly (Figs. 5, 6 or 7).

BLOWER MOTOR ELECTRICAL CIRCUIT—MERCURY INTERMEDIATE, FALCON AND FAIRLANE

For the blower motor circuit wiring diagram refer to Fig. 11 or the Wiring Diagram Manual Form 7795P-67.

HEATER HOSE ROUTING

Care must be taken when servicing the hoses to insure a smooth kink free installation for maximum heating (Fig. 12).

HEATER HOSE REPLACEMENT

To replace a heater hose, drain

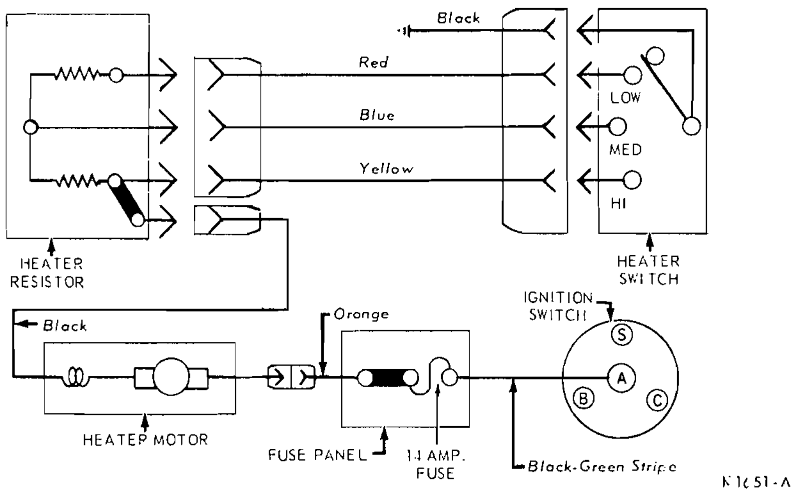


FIG. 11—Blower Motor Circuit—Mercury Intermediate, Falcon and Fairlane

the coolant, remove the hose, cut a new hose to the same length as the old hose, install the hose, and replace the coolant. **Make certain that the heater hoses do not come in contact with any part of the exhaust system.**

After the coolant has been replaced, bleed the air from the heater core.

BLEEDING AIR FROM HEATER CORE

Remove the hose at the outlet connection of the heater core (hose that leads to the water pump). Allow any trapped air to flow out. When a continuous flow of coolant is obtained, connect the hose to the core.

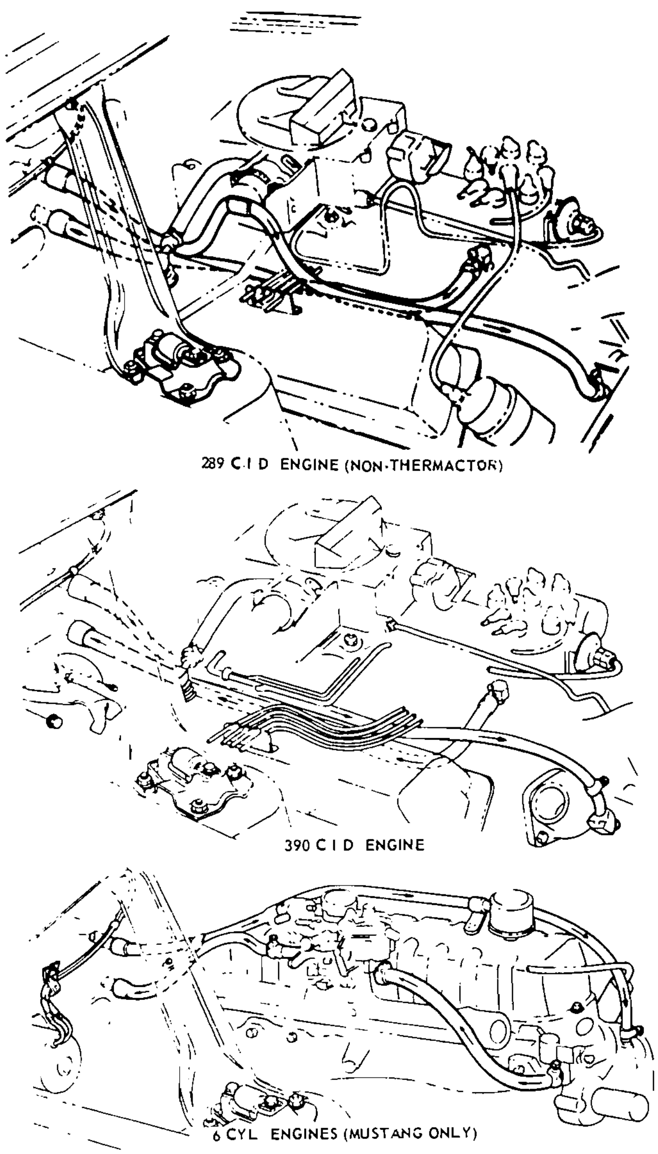


FIG. 12—Heater Hose Routings—Six and Eight Cylinder Engines

4 REMOVAL AND INSTALLATION

HEATER CORE—COUGAR, MUSTANG

REMOVAL

1. Remove the battery ground cable, and drain the cooling system.
2. Disconnect the heater hoses at the engine.
3. Loosen the screws at the choke housing and position the hose out.
4. Remove the nuts retaining the heater to the dash.
5. Remove the screw retaining the ground wire at the dash, and disconnect two wires. Remove the glove box liner.
6. Disconnect the defroster hoses, disconnect the temperature control cable, defroster control cable and heat control cable.
7. Remove the screw retaining the heater to the air intake. Lower the heater to the floor, pulling the hoses through the dash.
8. Remove the heater assembly from the vehicle, pulling the hose through the dash.
9. Remove both heater hoses at the heater core, remove the rubber boot from the air intake, and remove the clips retaining both halves of the heater together.
10. Separate both halves of the heater and remove the heater core.

INSTALLATION

1. Place the new core in position, place heater halves together and install the retaining clips.
2. Install rubber cement on the rubber seal and position it at the air intake.
3. Install the heater hoses to the core, position the heater assembly in the vehicle and feed the hoses through the dash.
4. Connect the defroster hoses, position the heater to the dash and install the screw retaining the heater to the air intake. Install the glove box liner.
5. Connect the defroster, temperature and heat control cables and adjust them.
6. Install the nuts retaining the heater to the dash, install the ground wire and connect the two leads.
7. Connect the hoses at the intake manifold and at the water pump.
8. Position the hose in the clamp on the choke housing and tighten the screws.
9. Fill the cooling system, connect the battery ground cable, and check the heater operation.

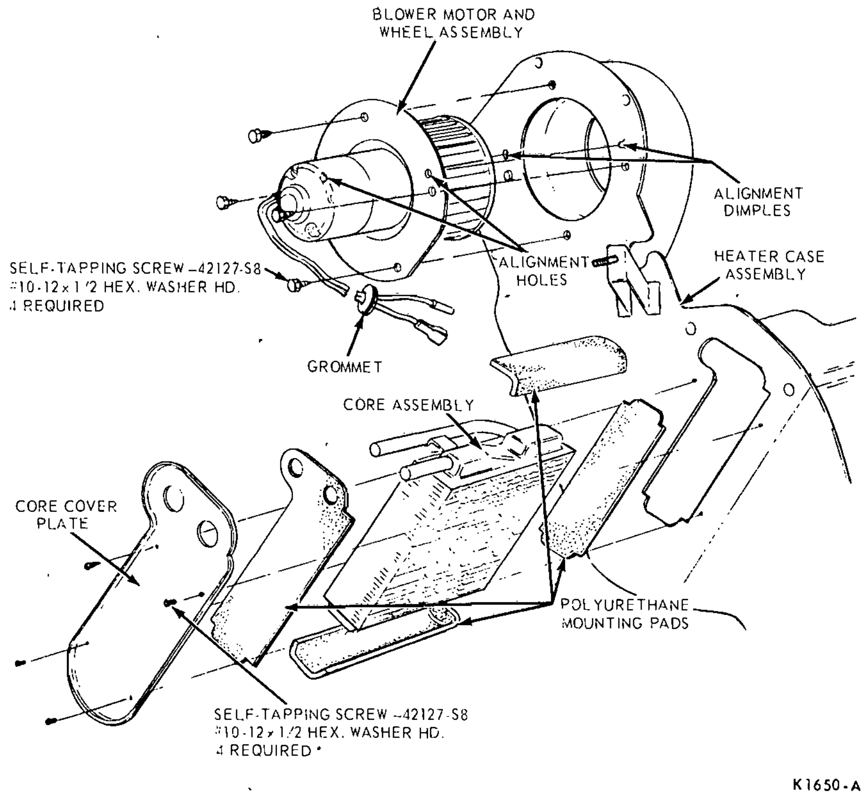


FIG. 13—Heater Blower Motor and Core Assemblies—Mercury Intermediate, Falcon and Fairlane

HEATER CORE—INTERMEDIATE MERCURY, FALCON AND FAIRLANE

REMOVAL

1. Drain the cooling system.
2. Disconnect both heater hoses at the dash.
3. Remove the nuts retaining the heater assembly to the dash.
4. Disconnect the temperature and defroster cables at the heater.
5. Disconnect the wires from the resistor, and disconnect the blower motor wires and the clip retaining the heater assembly to the defroster nozzle.
6. Remove the glove box.
7. Remove the bolt and nut retaining the right air duct control to the instrument panel. Remove the nuts retaining the right air duct and remove the duct assembly.
8. Remove the heater assembly to a bench.
9. Remove the heater core cover and pad and remove the core.

INSTALLATION

1. Transfer the seals from the old core to the new core.
2. Position the core in the heater and install the pad and cover.
3. Position the heater assembly in the vehicle and install the retaining nuts.
4. Connect the heater hoses (Fig. 13).
5. Connect the motor and resistor leads.
6. Connect and adjust (see Common Adjustments and Repairs), the temperature and defroster cables, and install the clip retaining the heater to the defroster nozzle.
7. Install the right air duct, and install the control cable to the instrument panel.
8. Install the glove box, and fill the cooling system.

HEATER BLOWER MOTOR—COUGAR, MUSTANG

REMOVAL

1. Disconnect the battery ground cable, drain the cooling system.
2. Disconnect the heater hoses at the engine.
3. Loosen the screws at the choke housing and position the hose out.

4. Remove the nuts retaining the heater to the dash.
5. Remove the screw retaining the ground wire at the dash, and disconnect two wires.
6. Remove the screw retaining the heater to the air intake. Lower the heater to the floor, pulling the hoses through the dash.
7. Remove the nuts retaining the motor mounting plate to the heater, and remove the motor and blower assembly.

INSTALLATION

1. Transfer the blower wheel and motor mounting plate to the new motor.
2. Install the motor and blower assembly to the heater.
3. Position the heater to the dash and install the screw retaining the heater to the air intake.
4. Install the nuts retaining the heater to the dash, install the ground wire and connect the two leads.
5. Connect the hoses at the intake manifold and at the water pump.
6. Position the hose in the clamp on the choke housing and tighten the screws.
7. Fill the cooling system, connect the battery ground cable, and check the heater operation.

HEATER BLOWER MOTOR—MERCURY INTERMEDIATE, FALCON AND FAIRLANE

REMOVAL

1. Drain the cooling system.
2. Disconnect both heater hoses at the dash.
3. Remove the nuts retaining the heater assembly to the dash.
4. Disconnect the temperature and defroster cables at the heater.
5. Disconnect the wires from the resistor, and disconnect the blower motor wires and the clip retaining the heater assembly to the defroster nozzle.
6. Remove the glove box.
7. Remove the bolt and nut retaining the right air duct control to the instrument panel. Remove the nuts retaining the right air duct and remove the duct assembly.
8. Remove the heater assembly to a bench.
9. Remove the blower mounting screws and remove the motor and wheel assembly.

INSTALLATION

1. Transfer the blower wheel and motor mounting plate to the new motor.
2. Install the motor and blower assembly to the heater.
3. Position the heater assembly in the vehicle and install the retaining nuts.
4. Connect the heater hoses (Fig. 13).
5. Connect the motor and resistor leads.
6. Connect and adjust (see Common Adjustments and Repairs), the temperature and defroster cables, and install the clip retaining the heater to the defroster nozzle.
7. Install the right air duct, and install the control cable to the instrument panel.
8. Install the glove box, and fill the cooling system.

HEATER TEMPERATURE CONTROL AND/OR DEFROSTER CONTROL CABLE—COUGAR, MUSTANG

REMOVAL

1. Disconnect the battery ground cable from the battery.
2. Remove the four screws retaining the heater control assembly to the instrument panel and position the control assembly outward.
3. Remove the two control cable retaining screws.
4. Remove the glove box liner retaining screws and remove the glove box liner.
5. Remove the retaining clamp and screw on each of the three cables at the crankarm.
6. Remove the complete control cable assembly (heater air, temperature and defroster cables).

INSTALLATION

1. Position the new cable assembly to the heater and install the retaining clamp and screw.
2. Position the cable assembly to the heater control assembly and install the two retaining screws.
3. Position the control assembly to the instrument panel and install the four retaining screws.
4. Loosen each control cable clamp at the crankarm. Adjust the cable length at each crankarm to obtain full off position with 1/8-inch overtravel to insure a positive shutoff.
5. Connect the battery ground cable to the battery.

HEATER CONTROL ASSEMBLY—MERCURY INTERMEDIATE

REMOVAL

The heater control switch is mounted to the instrument panel separately from the control assembly (Fig. 7).
1. Remove the defroster and heat control knobs.
2. Remove the screws retaining the control to the instrument panel and lower the control.
3. Remove the cables from the control.

INSTALLATION

1. Connect the cables to the new control (Fig. 7) and adjust the cables,.
2. Position the assembly to the instrument panel and install the retaining screws.
3. Install the control knobs.

HEATER CONTROL ASSEMBLY—FAIRLANE

To remove the control assembly, remove the three control knobs and remove two control mounting screws from the face of the instrument panel, then lower the control from under the panel and disconnect the Bowden cables.

The blower switch is located to the left of the two control levers and is retained with one screw in the face of the lower instrument panel (Fig. 5).

HEATER CONTROL ASSEMBLY—FALCON

To service the controls, remove the three knobs, remove two upper screws in the control bezel and two lower mounting nuts behind the instrument cluster. Lower the control assembly and disconnect the two Bowden cables and blower switch wiring (Fig. 6).

BLOWER SWITCH—COUGAR, MUSTANG

REMOVAL

1. Disconnect the battery ground cable.
2. Remove the screws retaining the heater control to the instrument panel, and position the control out.
3. Remove the heater switch control knob.
4. Disconnect the plug connector from the switch, remove the lead from the clip at the side of the control. Remove the switch retaining screw and remove the switch.

INSTALLATION

1. Position the new switch to the control and install the mounting screw.

2. Position the lead in the clip on the control and connect it.
3. Position the heater control assembly to the instrument panel and install the retaining screws.
4. Install the switch control knob, connect the battery and check the operation of the switch.

BLOWER SWITCH—MERCURY INTERMEDIATE, FALCON, FAIRLANE

1. Disconnect the battery ground cable.
2. Remove the switch control knob.
3. Remove the screws (bolt and nut on Fairlane), retaining the switch to the instrument panel, disconnect and remove the switch.
4. Connect the new switch, position it to the instrument panel and install the retaining screws (bolt and nut on Fairlane).
5. Install the control knob.
6. Connect the battery ground cable.

DEFROSTER NOZZLES—COUGAR, MUSTANG

1. Disconnect the defroster hose at the plenum.
2. Remove the defroster nozzle retaining nuts and remove the nozzle assembly.
3. Install the defroster nozzle to the instrument panel.
4. Install the nuts and washer assemblies.
5. Connect the hoses to the plenum.

DEFROSTER NOZZLES—MERCURY INTERMEDIATE, FALCON AND FAIRLANE

The Fairlane and Falcon have a common type nozzle; the nozzle for the Comet is unique due to the wider space between the two openings in the instrument panel.

1. Remove the glove box.
2. Remove the defroster nozzle retaining clip screw (Figs. 2 and 3).
3. Remove the defroster nozzle retaining nuts; two on the Fairlane and Falcon, and four on the Comet.
4. Lower the nozzle down and out from under the panel on the Fairlane and Falcon; remove the Comet nozzle through the glove box opening.

HEATER HOSE—COUGAR, MUSTANG

1. Drain the cooling system.
2. Disconnect the heater hose at the water pump or intake manifold.
3. Position the defroster hose to one side.
4. Loosen the hose clamp, and pull the hose through the dash from the engine compartment. The hose clamp will stay on top of the heater case.
5. Cut a new hose to the same length as the old hose.
6. Position the new hose through the dash, position the hose clamp over the hose, and connect it to the heater.
7. Connect the defroster hose to the heater. Connect the heater hose to the intake manifold or water pump (Fig. 13), and fill the cooling system.

INSUFFICIENT OR NO HEAT	1. Burned out fuse or loose wires to the heater blower. 2. Defective motor ground, or defective blower motor. 3. Fan loose on motor shaft, or motor stalled. 4. Defective heater blower switch. 5. A kinked, clogged, or collapsed water hose. 6. Improperly connected heater hoses. 7. Plugged heater core, or air outlet. 8. Improperly installed or defective engine thermostat. 9. Incorrectly installed and adjusted control cables. 10. Air leaks in the body. 11. Burned out resistor.
INSUFFICIENT OR NO DEFROSTING	1. Improperly adjusted defroster control cable, or disconnected defroster hose. 2. Binding defroster damper. 3. Plugged or loose defroster nozzle, or obstructed defroster openings at windshield. 4. Defroster hoses not properly attached at plenum. 5. Crash pad obstructing nozzle opening.
TOO MUCH HEAT	1. Incorrectly adjusted blend-air valve.

FIG. 14—Ventilating and Heating Trouble Diagnosis Guide

PART 16-2— Air Conditioning

1 DESCRIPTION AND OPERATION

Refer to Wiring Diagram Manual Form 7795P-67 for locations of wiring harnesses. Schematics are shown in Group 19 of this manual.

MERCURY INTERMEDIATE, FALCON AND FAIRLANE

SYSTEM OPERATION

Outside air is drawn in from the cowl through the outside air door into the right vent duct, into the blower scroll, forced through the evaporator core, through and/or around the heater core then mixed and discharged through either the A/C air duct or through the heat-defrost plenum air outlet, depending on the position on the control setting (Figs. 1 and 2).

The temperature door is located to the left of the evaporator core and to the rear of the heater core in the left side of the case.

The A/C-heat door is located in the left rear corner of the case, and the heat-defrost door is in the plenum chamber attached to the rear face of the case assembly.

A single defroster nozzle leading to two openings in the instrument panel is attached directly in the plenum chamber with a clip.

The A/C registers located in the lower instrument panel are located; one to the far left; one to the far right; and a double register in the center.

The A/C registers are barrel-type registers that can be moved up and down and the vertical vanes are positioned by moving a horizontal wheel within the assembly.

The blower motor and wheel assembly is located in the blower scroll immediately forward of the right vent duct assembly. The evaporator core is located in a diagonal position in the center of the case; and the heater core in a diagonal position in the left side of the case.

Vacuum actuators that operate the normal-recirc door in the right vent, and the A/C-heat door, are controlled by a vacuum selector on the control head assembly.

CONTROLS

The air temperature is controlled by the location of the temperature air blend lever in the control assembly (Figs. 3, 4 and 5). As the lever is moved from cool to warm, a Bowden cable moves the temperature blend door from maximum cooling position to minimum cooling position. A vacuum switch on the evaporator case is actuated to supply vacuum to close the water valve when the temperature lever is in the maximum cool setting and the A/C-heater, air distribution control lever is in either A/C position. See the A/C-Heater Control Setting Chart, Fig. 6 and the Vacuum Diagrams Book, Form FD-7943-67.

Air distribution is controlled by the A/C-heater lever in the control panel assembly and the blower switch setting. The lever actuates a vacuum selector switch on the control assembly which in turn operates vacuum actuators at the outside or recirculating air door in the right vent duct; the A/C-heat air-blend door in the case, and the heat-defrost door in the plenum chamber.

The blower switch must be on to engage the compressor clutch for air conditioning. With the A/C-heater control lever in either air condition-

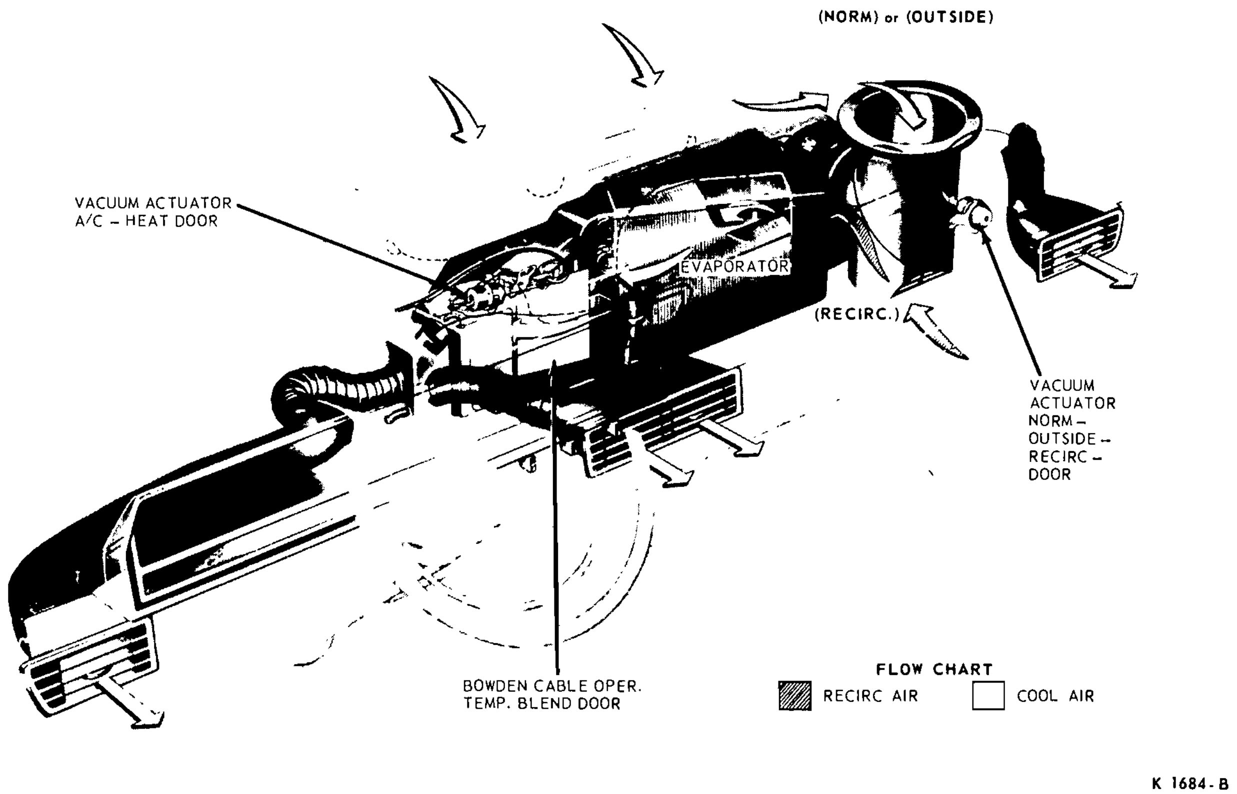


FIG. 1—Mercury Intermediate, Falcon and Fairlane A/C-Heater Air Flow—NORM-RECIRC

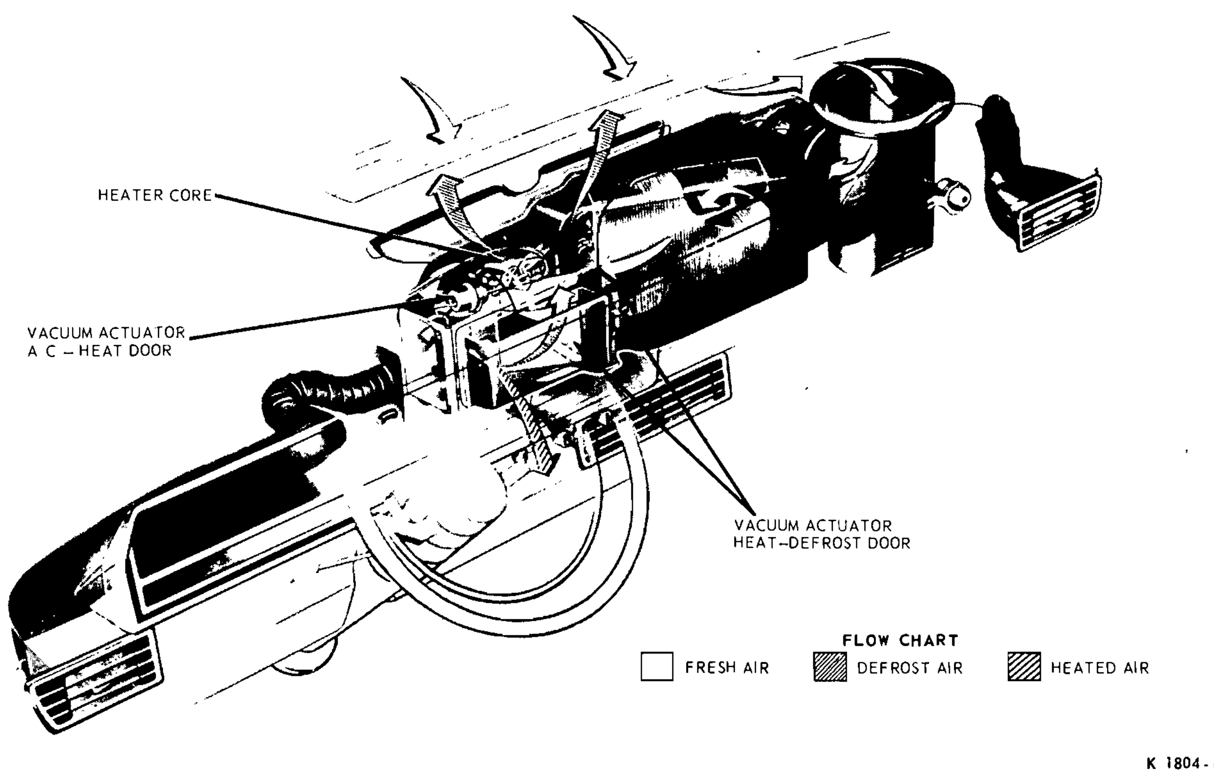


FIG. 2—Mercury Intermediate, Falcon and Fairlane A/C-Heater Air Flow—HEAT

ing position, the air conditioner heat door is on the air conditioning position (vacuum) and pressure is applied to the compressor clutch switch to close the circuit and engage the clutch.

Three speeds are provided for the blower fan with a four position switch in the control assembly and a resistor assembly located in the blower housing. The resistor in the blower motor circuit controls the low and medium blower motor speeds.

MUSTANG AND COUGAR

The 1967 Mustang and Cougar Select-Aire air conditioning system (Fig. 7) is an integral system receiving outside air directly from the cowl air intake, or recirculated air through the register on the right side of the evaporator case assembly. The control assembly is located in the instrument panel to the left of the steering column. Three vertical levers are used to control the system operation.

The two center A/C registers can be moved up and down and vertical vanes are positioned by rotating a horizontal wheel within each assembly. The two round outboard A/C registers can be rotated 360 degrees for air deflection and can be closed by rotating the lever below each register 90 degrees. Warm air is discharged through openings in the heater plenum over the tunnel to both right and left front floor areas.

SYSTEM OPERATION

Air is drawn directly into the system by the blower motor and wheel from the cowl air intake in FRESH A/C position; or through the recirculating air door in MAX position. The air is then drawn through the evaporator core, and depending upon the setting of the temperature blend door, is drawn through and around the heater core, pulled into the blower housing, and forced through the A/C registers.

With the controls set in either A/C position, the A/C-heat door directs air to the A/C-defroster plenum chamber; the A/C-defrost door directs air to the A/C outlets and the air is discharged through the four A/C registers (Fig. 7).

With the controls set in HEAT position, the A/C heat door directs the air so that it is discharged through the air outlets in the plenum above the tunnel (Fig. 7).

With the controls set in DEFROST position, the A/C-heat door directs the air to the A/C-defroster plenum;

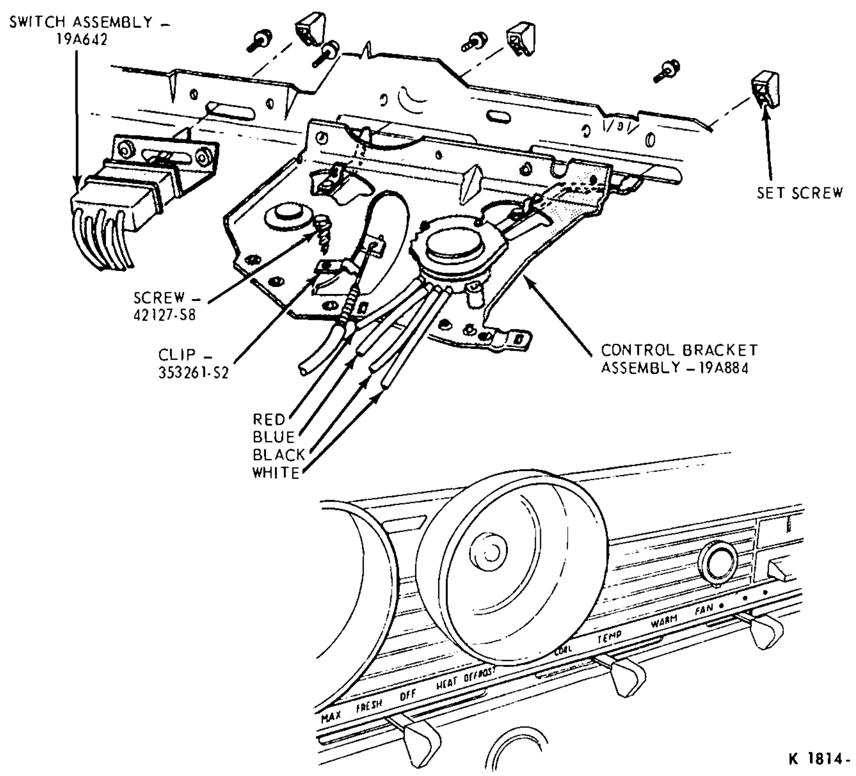


FIG. 3—Mercury Intermediate A/C-Heater Control Assembly

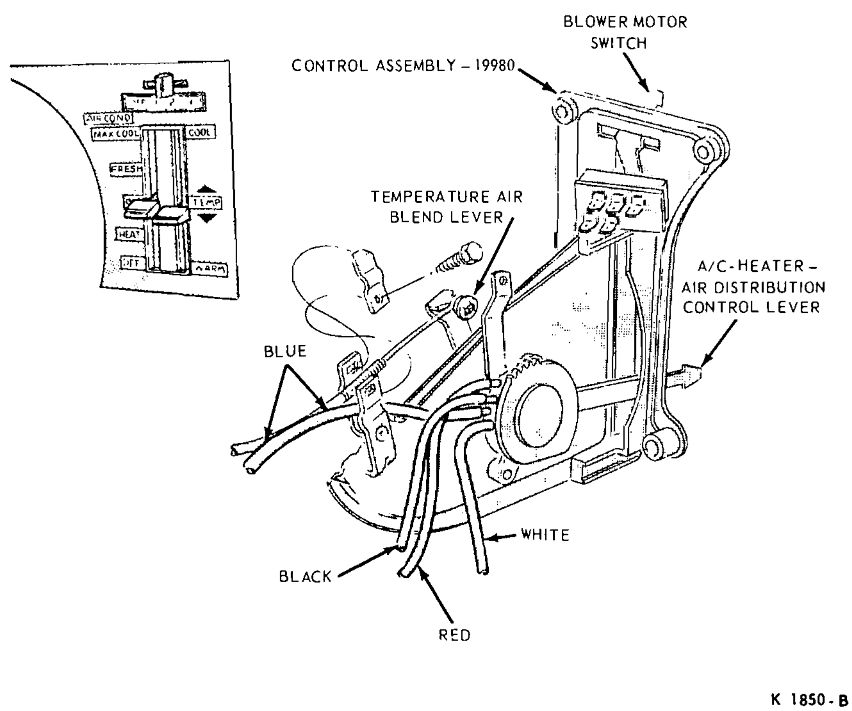


FIG. 4—Falcon A/C-Heater Controls

the A/C-defrost door directs the air so that it is discharged through the defroster nozzles to the windshield (Fig. 7).

A four-position blower switch and resistor assembly provides three blower speeds to control air volume. The blower switch must be on to engage the A/C clutch for air conditioning (Fig. 7).

CONTROLS

Refer to the A/C-Heater Control Setting Chart, Fig. 8.

The (left) functional control lever actuates a vacuum regulator that controls vacuum motors at the fresh-recirculating air door, reheat door, A/C-heat and A/C-defrost doors.

The (center) temperature control lever operates a control cable that controls the temperature blend door in the evaporator case, and actuates the vacuum operated water valve switch.

The (right) control lever operates the blower switch to control air volume with three blower speeds; low, medium and high.

The A/C thermostat (icing) switch and water valve vacuum switch is located on the evaporator case (Fig. 7).

The blower motor resistor is located in the blower housing (Fig. 7).

The expansion valve, water valve, and vacuum supply tank is located in the engine compartment on the right side near the dash panel.

DISCHARGE AIR

An A/C floor cooler tube located at the lower rear corner of the duct is used to discharge cold air to the center of the left front floor area. A deflector on the tube can be positioned manually for driver comfort.

The two outboard registers can be closed by a push-pull knob and lever that actuates the balanced door behind the registers. Mustang and Cougar models have a rotating knob on each grille. On the Fairlane and Falcon the knob is located below the registers on the lower lip of the instrument panel. The Mercury Intermediate and Cougar control knob is located in the instrument panel at the inboard side of each outboard register.

The plenum chamber located on the left rear face of the case assembly distributes heated air to the floor over the tunnel or to the windshield defroster nozzle, depending on the location on the heat-defrost door within the plenum.

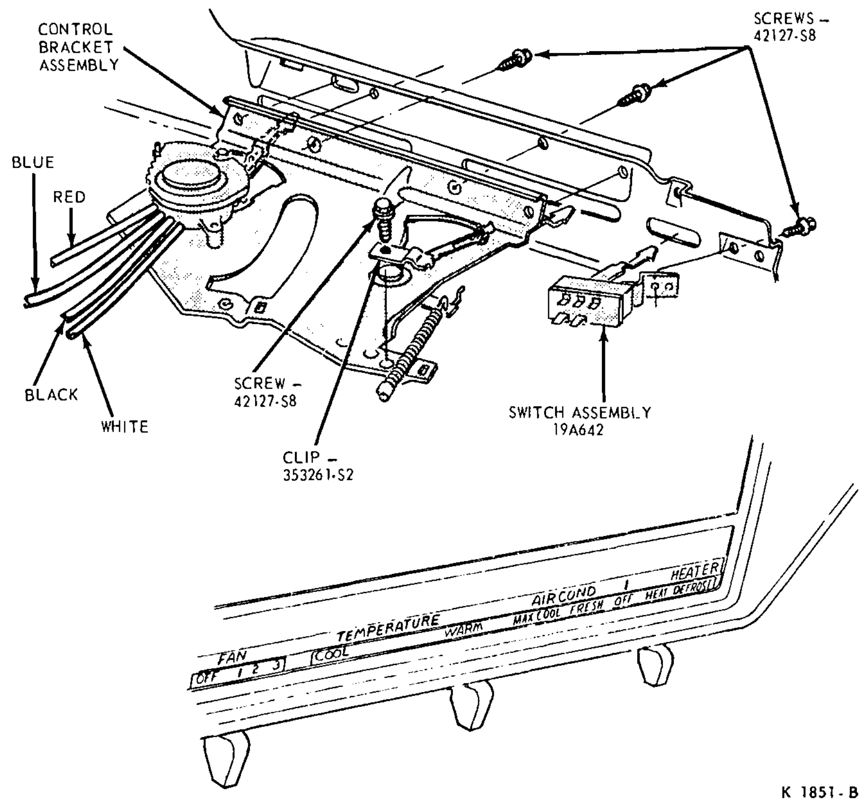


FIG. 5—Fairlane A/C-Heater Controls

TABLE 1—SELECTAIRE CONTROL SETTING CHART

		FUNCTIONAL CONTROL LEVER POSITION				
		A/C		OFF	HEAT	
		MAX COOL (RECIRC)	FRESH (OUTSIDE)		HEAT	DEFROST
AIR DOOR	OUTSIDE RECIRC	OPEN TO RECIRC V	OPEN TO OUTSIDE NV	OPEN TO RECIRC V	OPEN TO OUTSIDE NV	
AIR DOOR	A/C HEAT	A-C POSITION V		HEAT POSITION	NV	
AIR DOOR	HEAT DEFROST	NV		NV		DEFROST POSITION V
CLUTCH SWITCH		ON SEE WIRING DIAGRAM		OFF		
BLOWER SWITCH		ON-L-M-H	ON-L-M-H OFF-RAM AIR	OFF ON-RECIRC CONDITION	ON-L-M-H OFF-RAM AIR	
WATER VALVE VACUUM SWITCH	COOL	OPEN		VACUUM SWITCH BY-PASSED BY SELECTOR SWITCH CIRCUIT NV		
WATER VALVE VACUUM SWITCH	MOD	CLOSED				
WATER VALVE VACUUM SWITCH	WARM					
WATER VALVES LEFT (BLUE DOT)	COOL	CLOSED V		SELECTOR SWITCH CIRCUIT OPENS WATER VALVE BY CLOSING OFF VACUUM		
WATER VALVES LEFT (BLUE DOT)	MOD	OPEN NV				
WATER VALVES LEFT (BLUE DOT)	WARM					
WATER VALVES RIGHT (YEL LOW DOT)	COOL	CLOSED V				
WATER VALVES RIGHT (YEL LOW DOT)	MOD					
WATER VALVES RIGHT (YEL LOW DOT)	WARM					
TEMP DOOR	COOL	ALL COLD AIR BY-PASSES HEATER CORE			OUTSIDE AIR BY-PASSES HEATER CORE	
TEMP DOOR	MOD	COLD AIR PASSES THRU AND AROUND HEATER CORE THEN MIXED			OUTSIDE AIR PASSES THRUAND AROUND HEATER CORE - THEN MIXED	
TEMP DOOR	WARM	ALL COLD AIR PASSES THRU HEATER			OUTSIDE AIR PASSES THRU HEATER CORE	

L-LOW H-HIGH V-VACUUM MOD-MODULATED M-MEDIUM NV-NO VACUUM

* - Recirculated Air – Not Recommended

FIG. 6—Falcon, Fairlane, and Mercury Intermediate A/C Control Setting Chart

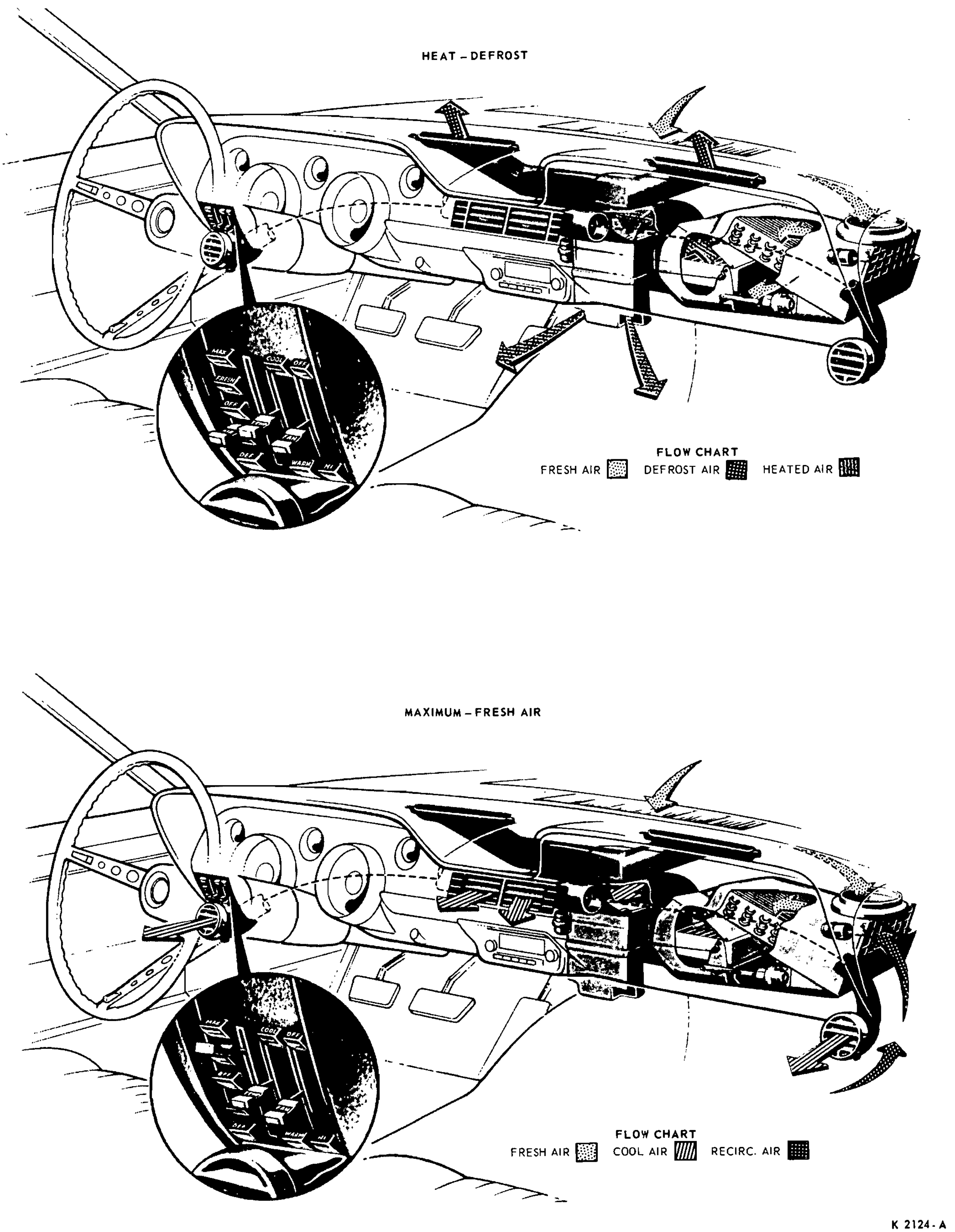


FIG. 7—Heater and Air Conditioner Air Flow—Mustang and Cougar

		FUNCTIONAL CONTROL LEVER POSITION				
		A/C		OFF	HEAT	
		MAX	FRESH		HEAT	DEFROST
AIR DOOR	OUTSIDE RECIRC 1	OPEN TO RECIRC V	OPEN TO OUTSIDE NV	OPEN TO RECIRC V	OPEN TO OUTSIDE NV	
	A/C HEAT 5	A/C POSITION V		HEAT POSITION NV		A/C V POSITION
	A/C DEFROST 6	A/C POSITION V			DEFROST POSITION V	
	REHEAT 2	REHEAT POSITION NV			HEAT POSITION V	
CLUTCH SWITCH		ON			OFF	
BLOWER SWITCH		ON-L-M-H	ON-L-M-H OFF-RAM AIR	OFF ON*-	ON-L-M-H OFF-RAM AIR	
WATER VALVE VACUUM SWITCH 3 4	COOL	OPEN				
	MOD					
	WARM	SEALED				
WATER VALVE 7	COOL	CLOSED V				
	MOD					
	WARM	OPEN NV				
TEMP DOOR	COOL	ALL COLD AIR BY-PASSES HEATER CORE		———	OUTSIDE AIR PASSES THRU HEATER CORE	
	MOD	COLD AIR PASSES THRU AND AROUND HEATER CORE THEN MIXED		———	OUTSIDE AIR PASSES THRU AND AROUND HEATER CORE THEN MIXED	
	WARM	ALL COLD AIR PASSES THRU HEATER CORE		———	OUTSIDE AIR BY-PASSES HEATER CORE	

L-LOW M-MEDIUM H-HIGH V-VACUUM NV-NO VACUUM MOD-MODULATED

*- Recirulated Air - Not Recommended

FIG. 8—A/C-Heater Control Setting Chart—Mustang and Cougar

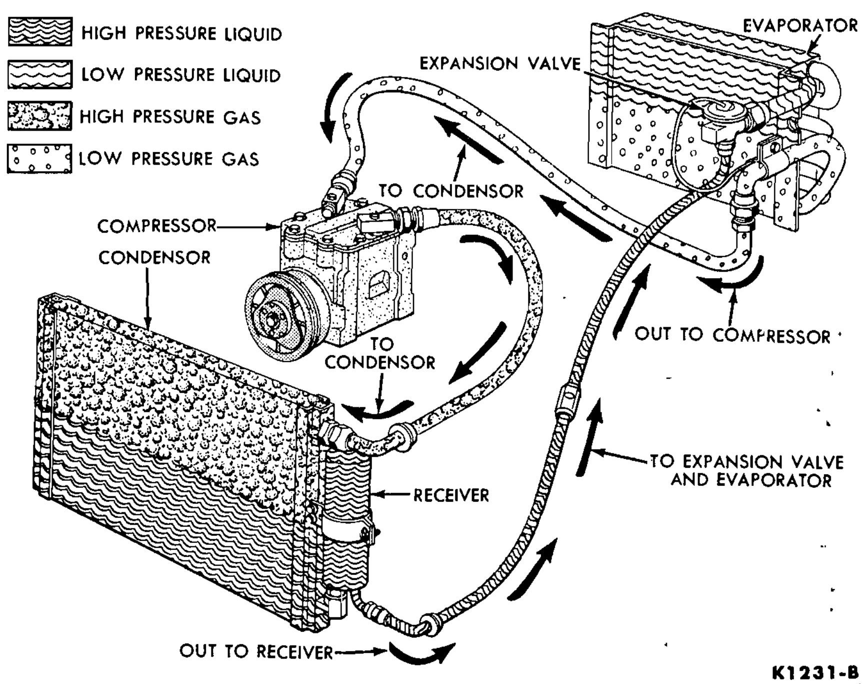


FIG. 9—Air Conditioning System

A/C—HEATER ELECTRICAL SYSTEM

The A/C heater electrical circuit is protected by a 25 ampere circuit breaker and consists of the blower switch on the control assembly, blower motor, blower motor resistor, A/C thermostatic switch, clutch switch and compressor clutch solenoid.

RECEIVER UNIT

The air cooling system stores the

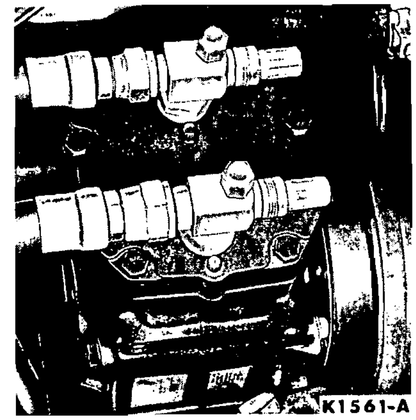


FIG. 10—Compressor Installed

liquid Refrigerant-12 under pressure in a combination receiver and dehydrator (Fig. 9). The pressure in the receiver normally varies from about 80 to 300 psi, depending on the surrounding air temperature and compressor speed.

The dehydrator serves the purpose of removing any traces of moisture that may have accumulated in the system. Even small amounts of moisture will cause an air cooling unit to malfunction. A fusible plug is screwed into the receiver. This will release the refrigerant before the refrigerant temperature exceeds 212° F.

EVAPORATOR UNIT

When the cooling system is in operation, the liquid Refrigerant-12 flows from the combination receiver and dehydrator unit through a flexible hose to the evaporator (Fig. 9) where it is allowed to evaporate at a reduced pressure, to cool the evaporator.

Passenger compartment air is blown through the evaporator fins and is thus cooled by the evaporator.

EXPANSION VALVE

The rate of refrigerant evaporation is controlled by an expansion valve (Fig. 9) which allows only enough refrigerant to flow into the evaporator to keep the evaporator operating efficiently, depending on its heat load.

The expansion valve consists of the valve and a temperature sensing capillary tube and bulb. The bulb is clamped to the outlet pipe of the evaporator. Thus the valve is controlled by evaporator outlet temperature.

The restricting effect of the expansion valve at the evaporator causes a low pressure on the low

pressure side of the system of 12 to 50 psi, depending on the surrounding air temperature and compressor speed.

COMPRESSOR UNIT

The evaporated refrigerant leaving the evaporator (now in the form of a gas) at a pressure of 12 to 50 psi is pumped by the compressor, located on the engine (Fig. 10), into the top of the condenser, located in front of the radiator.

The compressor maintains a pressure on its high pressure side of from 80 to 300 psi, depending on the surrounding air temperature and compressor speed.

As the now heated and compressed refrigerant gas flows down through the condenser, it is cooled by air passing between the sections of the condenser. The cooled, compressed refrigerant gas condenses to liquid refrigerant which then flows into the receiver.

LIQUID SIGHT GLASS

A liquid sight glass is mounted in the high pressure refrigerant line between the receiver and the expansion valve (Fig. 9). The sight glass is used to check whether there is enough liquid refrigerant in the system.

MAGNETIC CLUTCH

It is necessary to control the amount of cooling that the system produces. To accomplish this, the compressor is electrically cut in and out of operation by the use of a magnetic clutch pulley mounted on the compressor crankshaft (Fig. 9). The magnetic clutch is controlled by a thermostatic switch which has its temperature sensing tube inserted in the fins of the evaporator core.

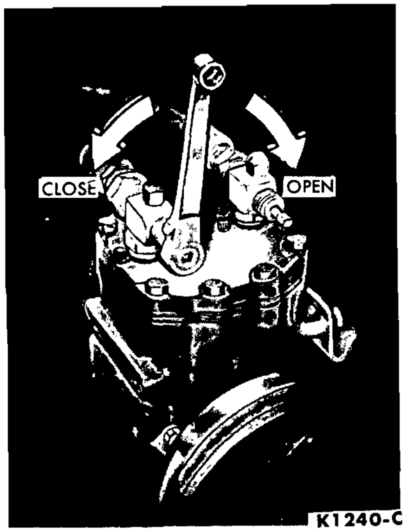


FIG. 11—Low Pressure Service Valve Gauge Port

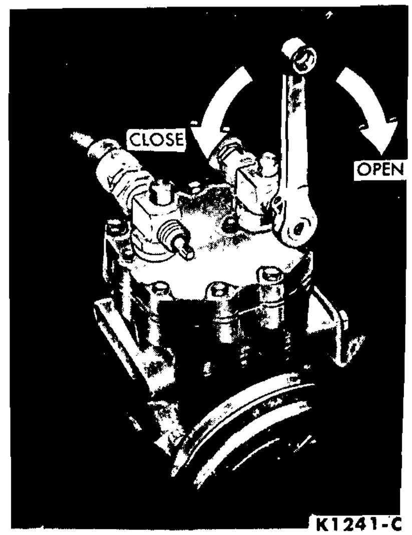


FIG. 12—High Pressure Service Valve Gauge Port

THERMOSTATIC SWITCH (ICING SWITCH)

The thermostatic switch controls the operation of the compressor by controlling the compressor magnetic clutch. The temperature sensing tube of the switch is placed in contact with the evaporator fins. When the temperature of the evaporator becomes too cold, the thermostatic switch opens the magnetic clutch electrical circuit, disconnecting the compressor from the engine. When the temperature of the evaporator rises to the upper limit at which the thermostatic switch is set, the thermostatic switch closes and energizes the magnetic clutch. This connects the compressor to the engine, and cooling action begins again.

When the ignition switch is off or the cooling control thermostatic switch is in the off position, the magnetic clutch is not energized, and the compressor can not operate.

When the ignition switch is on (engine running), and the cooling control is in the cooling range, the magnetic clutch is energized, the compressor is connected to the engine and the cooling system is in operation.

SERVICE VALVES

The service valves on the compressor are used to test and service the cooling system (Figs. 11 and 12). The high pressure service valve, mounted at the outlet to the compressor, allows access to the high pressure side of the system for attaching a pressure gauge, or a servicing hose.

The low pressure valve, mounted at the inlet to the compressor, allows access to the low pressure side of the system for attaching a pressure gauge or a servicing hose.

Both service valves may be used to shut off the rest of the system from the compressor during compressor service.

2 DIAGNOSIS AND TESTING

DIAGNOSIS

Refer to Fig. 23 for the air conditioning diagnosis.

TESTING

Obstructed air passages, broken belts, disconnected or broken wires, loose clutch, loose or broken mounting brackets may be determined by visual inspection of the parts.

BLOWER SWITCH TEST

Internal Short Between Terminals

To check the blower switch, place the switch in the off position. Then using a self-powered test light or ohm meter, check for continuity between all of the terminals, two at a time. If the light should go on this will indicate a short between the terminals, or a defective switch.

CHECKING FOR LEAKS

Attach the manifold gauge set (Fig. 13). Leave both manifold gauge valves at the maximum clockwise position. Set both service valves at the center position. Both gauges should now show approximately 60 to 80 pounds pressure at 75° F. If very little or no pressure is indicated, leave the vacuum pump valve closed, open the Refrigerant-12 tank valve, and set the

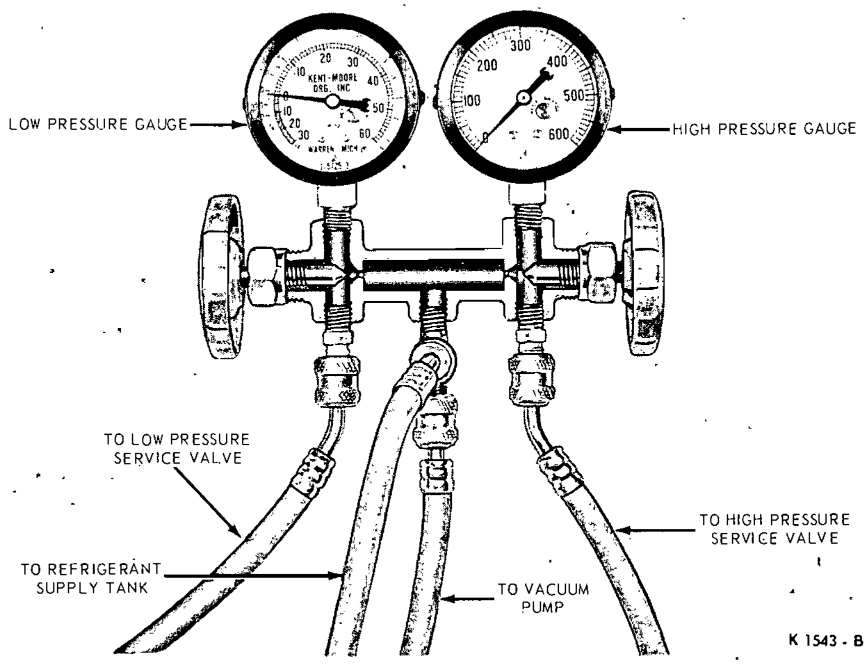


FIG. 13—Manifold Gauge Set

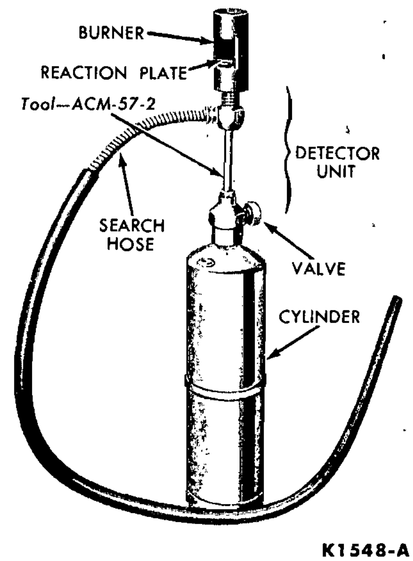


FIG. 14—Torch Type Leak Detector

low pressure manifold gauge valve to the counterclockwise position. This opens the system to tank pressure. Check all connections, and the compressor shaft seal for leaks, using a flame-type leak detector (Fig. 14). Follow the directions with the leak detector. The smaller the flame the more sensitive it is to leaks. Therefore, to insure accurate leak indication keep the flame as small as possible. The copper element must be red hot. If it is burned away, replace the element. Hold the open end of the hose at each suspected leak point for two or three seconds. The flame will normally be almost colorless. The slightest leak will be indicated by a bright green blue color to the flame. Be sure to check the manifold gauge set and hoses for leaks as well as the rest of the system.

If the surrounding air is contaminated with refrigerant gas, the leak detector will indicate this gas all the time. Good ventilation is necessary to prevent this situation. A fan, even in a well ventilated area, is very helpful in removing small traces of refrigerant vapor.

USE OF SIGHT GLASS

Clean the sight glass before checking for a proper charge of refrigerant. Then, observe the sight glass for bubbles with the engine running at 1500 rpm and the A/C controls set at maximum cooling. Bubbles in the sight glass indicate an undercharge of refrigerant. If an undercharge of refrigerant is found, check the system for leaks. Repair any leaks and charge the system with the proper amount of Refrigerant 12.

No bubbles in the sight glass indicate either a full charge of refrigerant or a complete loss of refrigerant. While observing the sight glass, cycle the magnetic clutch off and on, with the engine running at 1500 rpm. During the time the clutch is off, bubbles will appear if refrigerant is in the system and will disappear when the clutch is on. If no bubbles appear during the on and off cycle of the magnetic clutch, there is no refrigerant in the system. If there is no refrigerant in the system, it will be necessary to leak test, repair as required, and charge the system. **Under conditions of extremely high temperatures, occasional foam or bubbles may appear in the sight glass.**

CHECKING SYSTEM PRESSURES

The pressures developed on the high pressure and low pressure side of the compressor indicate whether or not the system is operating properly.

Attach the manifold gauge set (Fig. 13). It will not be necessary to attach the Refrigerant-12 tank unless refrigerant is to be added to the system. Set both manifold gauge valves at the maximum clockwise, or closed position. Set both service valves at the center position.

Check the system pressures with the engine running at 1500 rpm, all controls set for maximum cooling, and the front of the car at least 5 feet from any wall.

The actual pressures indicated on the gauges will depend on the temperature of the surrounding air and the humidity. Higher air temperatures along with low humidity, will give higher system pressures. The lowest figures given are for an ambient (surrounding air) temperature of 75° F., 50% relative humidity.

The low pressure gauge should indicate a pressure of from 12-50 pounds. The high pressure gauge should indicate a pressure 6 or 7 times the low pressure or 80-300 pounds.

At idle speed and a surrounding air temperature of 100° F-110° F., the high pressure may go as high as 300 pounds of more. If it becomes necessary to operate the air conditioner under these conditions, keep the high pressure down with a fan directed at the condenser and radiator.

INTERPRETING ABNORMAL SYSTEM PRESSURES

Low pressure below normal, high pressure normal

These pressures indicate a low charge or a restriction between the receiver and the expansion valve or between the expansion valve and the low pressure service valve. If the low pressure is actually a vacuum, the expansion valve is probably closed tightly. Check the expansion valve and replace it if required.

Check the system between the re-

ceiver outlet and the expansion valve for restrictions, by feeling all of the connections and components. Any portion that is cold to the touch or that frosts up, with the pressures as indicated here, is restricting the refrigerant flow.

Low Pressure Above Normal, High Pressure Normal

Observe both pressure gauges. If the low pressure is above normal (12-50 pounds) and the high pressure is at or near normal (80-300 pounds), the expansion valve is not operating properly. This condition may cause the compressor to receive slugs of liquid and thus to be very noisy. Also, the suction side of the compressor and the crankcase and head will be colder than normal and will frost up.

The expansion valve will allow too much liquid refrigerant to flow to the compressor if it is defective or, if the temperature sensing element is not making close contact with the evaporator outlet pipe. Make sure that the element is securely clamped to the outlet pipe, and properly covered.

High Pressure Below Normal, Low Pressure Above Normal

If the two pressures are equal or within 30 pounds of each other, the compressor may be defective. Perform a compressor test. Repair or replace the compressor as needed.

High Pressure Above Normal

High compressor head pressures are caused by an overcharge of refrigerant, condenser air passages clogged, a restriction between the condenser inlet and the receiver, or high surrounding air temperatures. Check the condenser fins for dirt or insects and clean as required. If the high pressure is still excessive, discharge the system through the discharge service valve. Check for a restricted condenser or a restriction between the condenser and the receiver. Evacuate the system and charge with the specified amount of Refrigerant 12.

THERMOSTATIC SWITCH TEST

The switch must be removed for this test. Move the switch arm to the coldest temperature setting by holding the arm against the stop nearest to the vacuum actuator. At room temperature the switch should be closed. Use a self-powered test light or ohmmeter connected to the switch leads to check whether or not the switch is closed. Release the switch arm. The switch should be open.

MAGNETIC CLUTCH

Disconnect the magnetic clutch wire at the bullet connector, and connect it to the negative lead of an ammeter. Connect the positive lead of the ammeter to the battery positive terminal. The magnetic clutch should pull in with a distinct click and the current reading on the ammeter should be to specification.

BLOWER MOTOR

Disconnect the blower motor wire at the bullet connector, and connect it to the negative lead of an ammeter. Connect the positive lead of the ammeter to the battery positive terminal. The motor should operate and the reading on the ammeter should be to specification.

EXPANSION VALVE

Remove the expansion valve from the evaporator. Connect the Refrigerant-12 supply hose to the expansion valve inlet with a suitable adapter. Open the refrigerant supply valve slightly. Refrigerant gas should come out of the expansion valve outlet. If no gas comes out of the outlet, the temperature sensing element has lost its charge and the expansion valve must be replaced.

COMPRESSOR TEST

Attach the manifold gauge set (Fig. 13). It will not be necessary to attach the Refrigerant-12 tank or the vacuum pump. Set both manifold gauge valves at the maximum clockwise, or closed, position. Close the suction service valve (maximum clockwise position).

Operate the engine at 1500 rpm. Set the air conditioner controls for maximum cooling to engage the compressor clutch. The suction gauge should read 20 inches of vacuum within 30 seconds. Disengage the clutch by setting the air conditioner controls to OFF. The suction gauge should remain below zero psi for at least one minute.

If the compressor does not satisfy these two conditions after at least 3 cycles of clutch engagement, the compressor has either a blown head gasket or faulty valves. Remove the head and inspect the valve plate for damage. Replace the valve plate if necessary. Replace a compressor if the cylinder walls are scored or pieces of metal are imbedded in the pistons.

A/C-HEAT DOOR OR TEMPERATURE BLEND DOOR

With the engine and A/C system or heater system operating, move the control to various positions and observe whether the vacuum actuator moves the air door.

If the door is binding, lubricate the door pivot points and again check for free operation. If the binding condition still exists, lubricate the interference areas on the plenum chamber with Lubriplate.

VACUUM ACTUATORS

Remove the vacuum line at the actuator, if possible. Use a gauge to check for the correct vacuum supply.

Check to see if vacuum is available to the control assembly by removing the vacuum supply line from the control assembly and checking for vacuum in the line. If vacuum is not available, the vacuum supply system back to the engine must be repaired.

If the vacuum is available, check the operation of the vacuum actuators by noting the operation of the air doors as the control lever is moved through the control positions. Refer to the table in this section for the door positions in relation to the control position. If the doors are not operating properly, check the vacuum lines for leaks or improper connections. If the vacuum lines are not causing the problem, check the vacuum at the control assembly. If the vacuum is not available to the actuator vacuum lines when it should be, replace the vacuum regulator on the control assembly.

3 COMMON ADJUSTMENTS AND REPAIRS

SAFETY PRECAUTIONS

The refrigerant used in the air conditioner system is Refrigerant-12. Refrigerant-12 is nonexplosive, noninflammable, noncorrosive, has practically no odor, and is heavier than air. Although it is classified as a safe refrigerant, certain precautions must be observed to protect the parts involved and the person who is working on the unit.

Use only Refrigerant-12. Liquid Refrigerant-12, at normal atmospheric pressures and temperatures, evaporates so quickly that it tends to freeze anything that it contacts. For this reason, extreme care must be taken to prevent any liquid refrigerant from coming in contact with the skin and especially the eyes.

Refrigerant-12 is readily absorbed by most types of oil. It is therefore recommended that a bottle of sterile mineral oil and a quantity of weak boric acid solution be kept nearby when servicing the air conditioning system. Should any liquid refrigerant get into the eyes, use a few drops of mineral oil to wash them out, then wash the eyes clean with the weak boric acid solution. Seek a doctor's aid immediately even though irritation may have ceased.

Always wear safety goggles when servicing any part of the refrigerating system.

The Refrigerant-12 in the system is always under pressure. Because the system is tightly sealed, heat applied to any part would cause this pressure to build up excessively.

To avoid a dangerous explosion, never weld, use a blow torch, solder, steam clean, bake body finishes, or use any excessive amount of heat on or in the immediate area of any part of the air cooling system or refrigerant supply tank, while they are closed to the atmosphere whether filled with refrigerant or not.

The liquid refrigerant evaporates so rapidly that the resulting refrigerant gas will displace the air surrounding the area where the refrigerant is released. To prevent possible suffocation in enclosed areas, always discharge the refrigerant from an air cooling system into the garage exhaust collector. Always maintain good ventilation surrounding the work area. **If the car is to be undercoated, make certain that the under coating does not plug the evaporator drain tubes.**

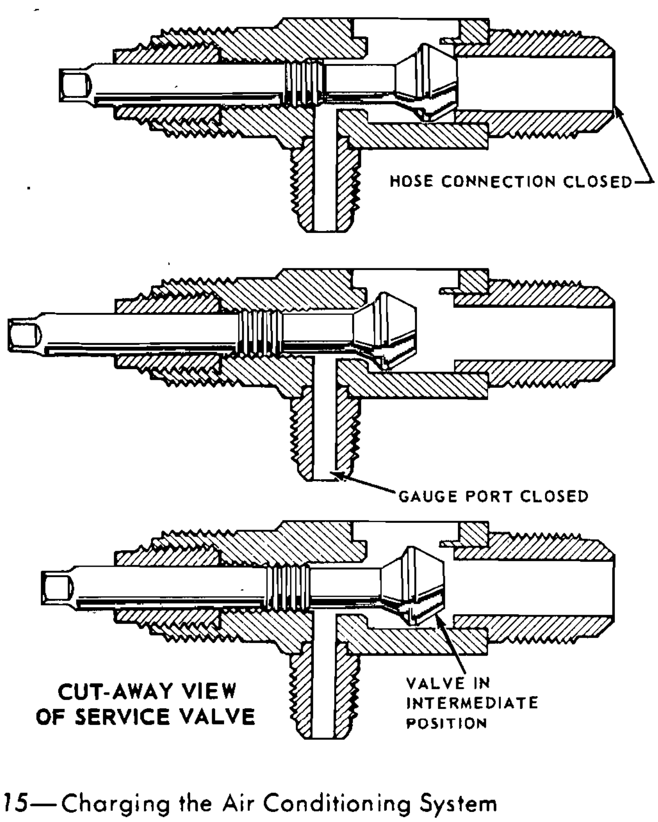
Although Refrigerant-12 gas, under normal conditions, is nonpoisonous, the discharge of refrigerant gas near an open flame can produce a very poisonous gas. This gas will also attack all bright metal surfaces. This poisonous gas is generated when the flame-type leak detector is used. Avoid inhaling the fumes from the leak detector. **Make certain that Refrigerant-12 is both stored and installed in accordance with all state and local ordinances.**

When admitting Refrigerant-12 gas into the cooling unit, always keep the tank in an upright position. If the tank is on its side or upside down, liquid Refrigerant-12 will enter the system and damage the compressor. **In surrounding air temperatures above 90° F., prolonged engine idle will result in excessively high compressor pressures.**

DISCHARGING THE SYSTEM

Discharge the refrigerant from the system before replacing any part of the system, except the compressor.

To discharge the system, connect the manifold gauge set to the system. Do not connect the manifold center connection hoses to the Refrigerant-12 tank, or vacuum pump. Place the open end of these hoses in a garage exhaust outlet. Set the high pressure manifold gauge valve at the maxi-



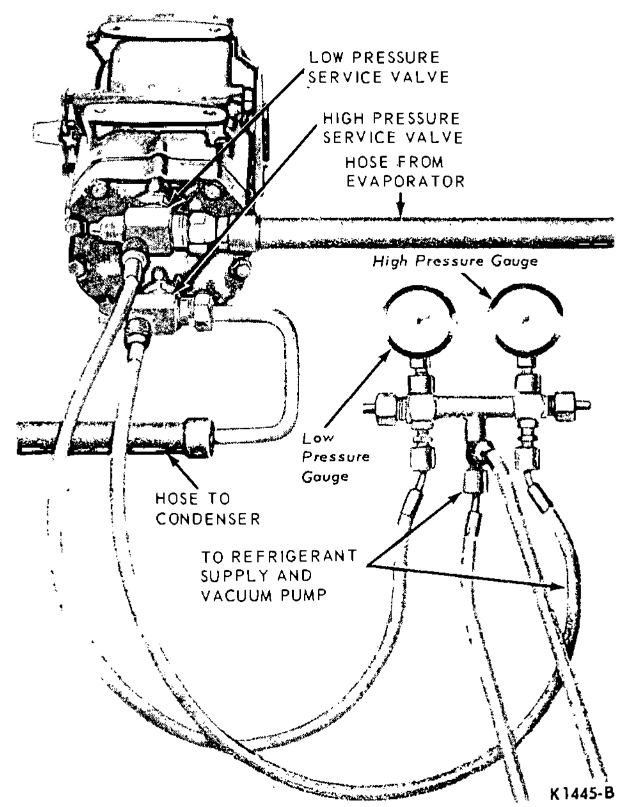


FIG. 15—Charging the Air Conditioning System

mum counterclockwise or open position. Open the high pressure service valve a slight amount (Fig. 12) and allow the refrigerant to discharge slowly from the system.

Do not allow the refrigerant to rush out, as the oil in the compressor will be forced out along with it.

EVACUATING THE SYSTEM

Attach the manifold gauge set, a tank of Refrigerant-12 and a vacuum pump to the system. Make certain that the Refrigerant-12 tank valve is tightly closed. Set both service valves to the mid-position. Open both manifold valves. Release any pressure in the system. Open the vacuum pump valve and run the pump until the low pressure gauge reads at least 25 inches, and as close to 30 inches of vacuum as possible. Continue vacuum pump operation for 20 to 30 minutes to boil any moisture out of the system. Close the pump valve. Turn off the pump.

CHARGING THE SYSTEM

Check for leaks first (See Diagnosis and Testing in this part), release the pressure, then evacuate the system. Leave both service valves at the mid-position (Fig. 15), and the vacuum pump valve closed. Leave the low pressure manifold gauge valve at the maximum counterclockwise or open position. Set the high pressure manifold gauge valve at the maximum clockwise or closed position. Set all controls to the maximum cold position.

Open the Refrigerant-12 tank valve. Run the engine at 1500 rpm. Charge the system until the weight of refrigerant is to specification.

It may be necessary to place the Refrigerant-12 tank in a container of hot water at about 150° F. to force the gas from the tank during the charging.

Never heat the Refrigerant-12 tank with a torch. A dangerous explosion may result.

During the charging, the high pressure may build up to an excessive value. This can be caused by an overcharge of refrigerant, or an overheated engine, in combination with high surrounding temperatures. Never allow the high pressure to exceed 240 pounds while charging. Stop the engine, determine the cause, and correct it.

After the proper charge has been made, close the Refrigerant-12 tank valve, and check the system pressures for proper operation. Set both service valves at the maximum counterclockwise position. Remove the gauge set, and cap the service valve gauge ports and valve stems.

CHARGING FROM SMALL CONTAINERS

Refrigerant-12 is available in one-pound cans. A scale is not necessary if these small containers are used instead of a tank.

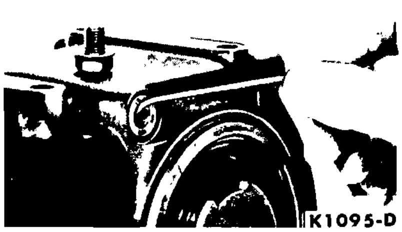


FIG. 16—Compressor Oil Level Check

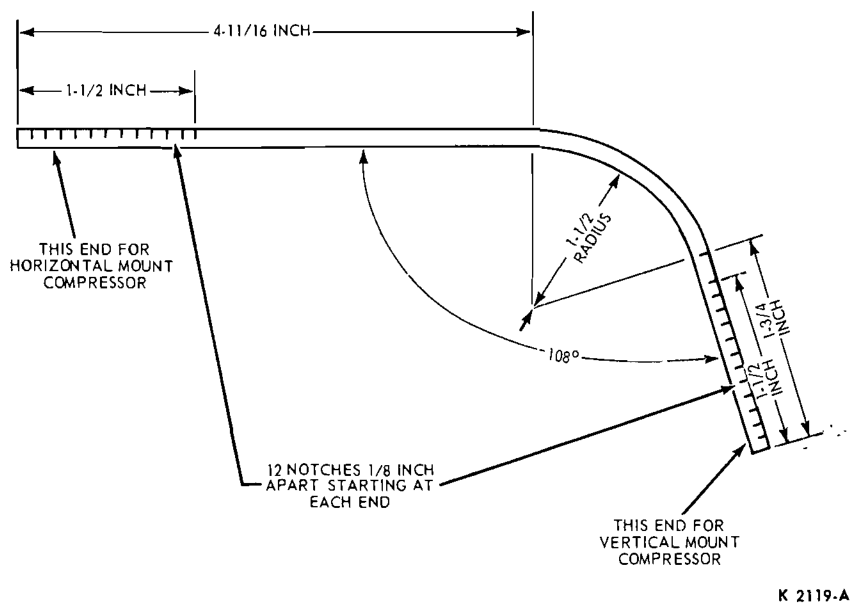


FIG. 17—York Compressor Oil Level Dipstick

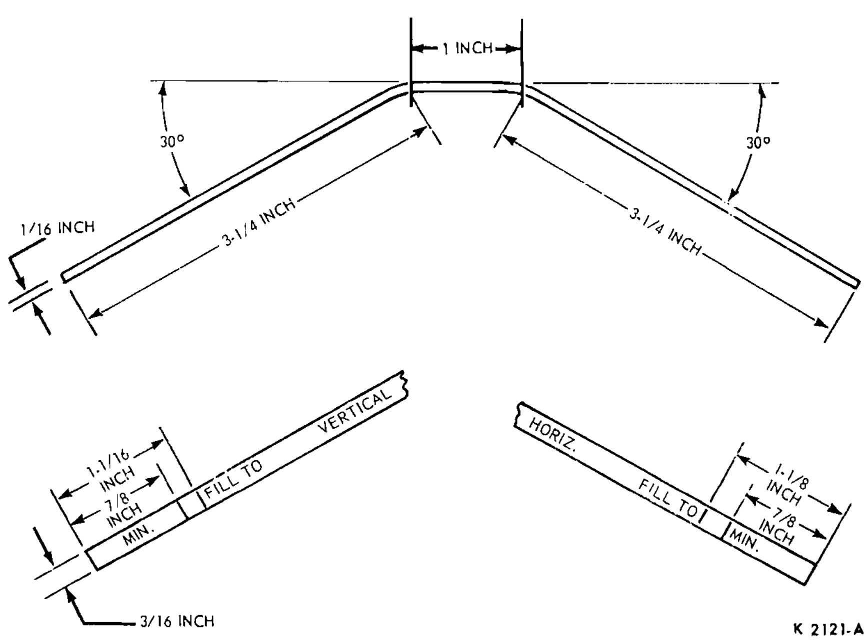


FIG. 18—Tecumseh Compressor Oil Level Dipstick

Attach the hose that would normally go to the large tank to the special valve that is provided for the small cans. Close the valve (maximum clockwise position) and follow the procedure for leak testing, evacuating and charging the system as previously given.

For charging, attach a one-pound can of Refrigerant-12 to the special valve, and open the valve. Keep the can in an upright position. When the can is empty (no frost showing), close the valve, remove the empty can, attach a new one, and open the valve again.

Allow only the specified amount of refrigerant to be pumped into the system (Part 16-5). The frost line on the can will indicate what portion of the can has entered the system. Then close the valve at the can. The system will then have been charged with the correct weight in pounds of refrigerant.

Check the system pressures, set both service valves at the maximum counterclockwise position. Remove the gauge set, and cap the service valve gauge ports and valve stems.

COMPRESSOR OIL LEVEL CHECK

Under normal conditions, when the air cooling system is operating satisfactorily, the compressor oil level need not be checked. There is no place for the oil to go except inside the sealed system. When the car is first started, some of the oil will be pumped into the rest of the system. After 15 minutes of operation, most of the oil is returned to the compressor crankcase.

Check the compressor oil level only if a portion of the refrigerant system is being replaced, or if there was a leak in the system and the refrigerant is being replaced.

Check the oil after the system has been charged and has been operating at an engine speed of 1500 rpm for 15 minutes in 60° F. surrounding air temperature or above. Turn off the engine, and isolate the compressor. Remove the oil filler plug from the compressor; insert a flattened 1/8-inch diameter rod (Fig. 16) in the oil filler hole until it bottoms. The rod should show at least the minimum amount of oil as shown in Figs. 17 and 18. It may be necessary to rotate the compressor crankshaft slightly by hand so that the dipstick will clear the crankcase. If additional oil is needed in the compressor, add Suniso 5 or Capella E refrigerator compressor oil or equivalent.

If more than the maximum amount of oil is indicated, as might happen if a new compressor is installed and oil already in the system is pumped back to the compressor, draw out the excess oil until the proper quantity is indicated.

Replace the oil filler plug, then evacuate and connect the compressor back into the system. Be sure to check the compressor filler opening for leaks.

ISOLATING THE COMPRESSOR

This procedure is used when checking the compressor oil level and when it is desired to replace the compressor without losing the refrigerant charge.

To isolate the compressor from the system, turn both the high and the low pressure service valves to the extreme clockwise position. Loosen the cap on the high pressure service valve gauge port, and allow the gas to escape until the compressor is relieved of refrigerant pressure.

Loosen the cap a small amount only, and do not remove it until the pressure is completely relieved.

To connect the compressor back into the system, evacuate the compressor at the high pressure service valve gauge port, close the vacuum pump valve, turn both service valves to the maximum counterclockwise position, and cap the high pressure service valve gauge port and service valve stems.

HEATER TEMPERATURE CONTROL CABLE ADJUSTMENT —MUSTANG

1. Remove the glove box liner.
2. Loosen the temperature control cable clamp.
3. Move the temperature control to within 1/8 inch of the high heat position.
4. Move the blend air door to the heat position and tighten the cable retaining clamp.
5. Install the glove box liner.

4 REMOVAL AND INSTALLATION

HEATER AIR CONDITIONER ASSEMBLY—FALCON, FAIRLANE AND MERCURY INTERMEDIATE

REMOVAL

1. Partially drain the cooling system.
2. Discharge the air conditioning system.
3. Disconnect the heater hoses at the dash and remove the weather seal gasket.
4. Unwrap the insulation from the sensing bulb and unclamp the bulb. Disconnect the receiver to evaporator hose at the dash panel. Leave the expansion valve attached to the hose. Remove the weatherseal at the dash.
5. Disconnect the evaporator to compressor hose at the dash panel.
6. Remove the glove box liner.
7. Remove the right hand fresh air duct from the cowl upper panel. Remove the vacuum line from the vacuum actuator.
8. Disconnect the wires from the resistor block and thermostatic switch.
9. Disconnect the three plenum to instrument panel air ducts from the plenum and position them out of the way.
10. Disconnect the vacuum line from the heat-defrost door vacuum actuator.
11. Remove the defroster plenum and vacuum actuator as an assembly.
12. Remove the instrument panel upper and lower support and remove the speaker grille.
13. Remove the speaker retaining screws and position the speaker out of the way.
14. Remove the defroster nozzle.
15. Remove the evaporator case drain hose clamp and drain hose at the dash.
16. Cover the floor mats and remove the 4 nuts retaining the heater air conditioner assembly to the dash. Pull the assembly from the dash and rest it on the car floor.
17. Disconnect the wire from the thermostatic switch.
18. Disconnect the temperature-blend door actuating Bowden cable and the vacuum line at the A/C-heat door vacuum actuator.
19. Position the front seat all the way back, turn the bottom of the assembly toward the rear of the car and remove the assembly from the car.

INSTALLATION

1. Position the assembly under the

instrument panel resting it on the floor.

2. Connect the thermostatic switch wire (left top of plenum).

3. Connect and adjust (as shown in Fig. 19), the temperature-blend door Bowden cable.

4. Connect the vacuum line at the A/C-heat door vacuum actuator.

5. Position the heater-air conditioner assembly to the dash and install the mounting nuts.

6. Install the defroster nozzle, the speaker and speaker grille.

7. Install the instrument panel upper and lower supports.

8. Install the defroster plenum and connect the red vacuum line to the heat-defrost door vacuum actuator.

9. Connect the wires to the resistor block and thermostatic switch.

10. Install the right hand fresh air duct and the vacuum actuator and install the white vacuum line to the actuator.

11. Install the glove box liner and install the 3 plenum to instrument panel air ducts.

12. Position the rubber seals and connect the heater hoses.

13. Install the evaporator case drain hose.

14. Connect the compressor-to-evaporator hose at the dash and install the expansion valve temperature sensing bulb.

15. Connect the receiver to evaporator hose at the dash and install the seal and temperature bulb insulation.

16. Fill the cooling system.

17. Leak test, evacuate and charge the air conditioning system.

18. Check the operation of the system.

EVAPORATOR CORE

1. Remove the heater air-conditioner assembly and place it on a bench.

2. Remove the thermostatic switch from the evaporator.

3. Remove the back plate from the evaporator case.

4. Remove the evaporator core from the housing.

5. Transfer the mounting bracket and rubber pad to the new evaporator.

6. Install the evaporator in the plenum.

7. Position the plenum to the housing and install the mounting screws, clips, resistor block wires and seal and retainer.

8. Install the heater-air conditioner assembly.

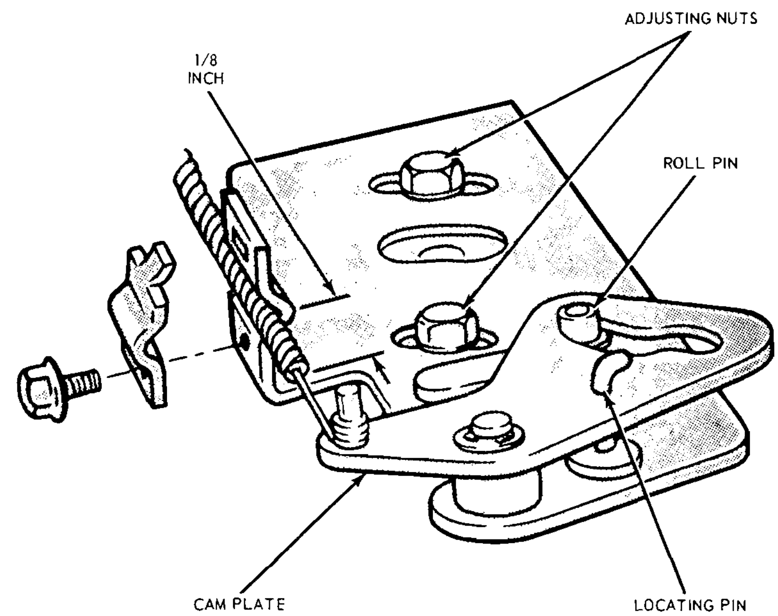


FIG. 19—Temperature-Blend Door Bowden Cable Adjustment—Except Mustang and Cougar

HEATER CORE

1. Remove the heater air conditioner assembly and place it on a bench.

2. Remove the back plate from the evaporator case.

3. Slip the heater core out of the plenum.

4. Slip the new core with seal into the plenum.

5. Install the plenum to the heater housing. Connect the wires at the resistor block, and install the seal and retainer at the evaporator tubes.

6. Install the heater-air conditioner assembly.

EVAPORATOR AND HEATER CORES—MUSTANG AND COUGAR

REMOVAL

1. Drain the engine coolant.

2. Discharge the refrigerant system.

3. Disconnect the heater hoses and refrigerant lines at the dash panel and remove the dash panel seal and retainers.

4. Remove the vacuum supply tank.

5. Remove two evaporator case mounting stud nuts and one blower housing mounting stud nut on the engine side of the dash panel.

6. Open the glove box.

7. Disconnect the vacuum hoses from the reheat and outside-recirculating vacuum motors.

8. Disconnect the control cable from the temperature-blend door.

9. Disconnect the wiring from the A/C thermostat (icing) switch.

10. Remove the evaporator rear support bracket screw.

11. Remove one blower housing support to cowl panel screw.

12. Move the blower housing to the left, away from the evaporator case.

13. Pull the drain tube from the hole in the carpet and floor pan.

14. Move the evaporator case rearward and downward under the instrument panel.

15. Disconnect the vacuum hoses from the A/C-heat and A/C-defrost vacuum motors.

16. Disconnect the wiring from the A/C clutch switch, blower motor resistor and the blower motor.

17. Remove the blower housing and A/C-defrost plenum chamber assembly down toward the right side and remove them from the vehicle.

18. Remove the twelve upper-to-lower case flange clips.

19. Slide the A/C thermostat switch

capillary tube from the hole in the side of the upper case.

20. Remove the dash panel stud mounting bracket screws.

21. Remove the evaporator core from the upper case.

22. Remove the rubber grommet from the core tubes.

23. Remove the water valve vacuum switch, two retaining screws, and remove the switch.

24. Remove the upper frame and temperature blend door screws, shaft and lever assembly, and retaining clip.

25. Remove the lower frame four retaining screws and remove the lower frame.

26. Remove the retaining clip on the reheat-door lever, position the motor arm out of the way and remove the shaft and lever assembly, and the reheat door.

27. Remove the heater core.

INSTALLATION

1. Position the heater core and assemble the reheat door and the reheat door lever. Install the retaining clip on the reheat door lever.

2. Position the lower frame and install the four retaining screws.

3. Assemble the upper frame and temperature-blend door, shaft and lever assembly and retaining clip.

4. Position the water valve vacuum switch and install the two retaining screws.

5. Position the rubber grommet on the core tubes and position the evaporator core in the upper case.

6. Install the two dash panel stud mounting bracket screws.

7. Slide the A/C thermostat switch capillary tube into the hole in the side of the upper case.

8. Install the twelve upper-to-lower case flange clips.

9. Position the blower housing on the tunnel before installing the evaporator. Install the evaporator and then position the blower housing in place.

10. Connect the wiring to the A/C clutch switch, the blower motor resistor and the blower motor.

11. Connect the vacuum hoses to the A/C-heat and A/C-defrost vacuum motor.

12. Position the evaporator case forward and upward under the instrument panel.

13. Route the drain tube through the hole in the carpet and floor pan.

14. Position the blower housing to the evaporator case and install the blower housing support-to-cowl panel screw.

15. Install the evaporator rear support screw.

16. Connect the wiring to the A/C thermostat (icing) switch.

17. Connect the control cable to the blend-air door.

18. Connect the vacuum hoses to the reheat and outside-recirculating vacuum motors.

19. Install the blower housing mounting stud nut and the two evaporator case mounting stud nuts on the engine side of the dash panel.

20. Install the vacuum supply tank.

21. Install the dash panel seal and retainers and connect the heater hoses and refrigerant lines at the dash panel.

22. Refill the engine cooling system.

23. Evacuate and charge the A/C system with 1 3/4 pounds of Refrigerant 12.

THERMOSTATIC SWITCH—FALCON, FAIRLANE AND MERCURY INTERMEDIATE

REMOVAL

1. Remove the heater and air conditioner assembly from the vehicle.

2. Remove the two thermostatic switch attaching screws.

3. Pull the switch sensing tube from the evaporator core.

INSTALLATION

1. Insert the sensing tube into the evaporator core fins.

2. Position the thermostatic switch to the evaporator housing and install the two attaching screws.

3. Install the heater and air conditioner assembly in the vehicle.

THERMOSTATIC SWITCH—MUSTANG AND COUGAR

REMOVAL

1. Remove the glove box liner.

2. Disconnect the wires from the thermostatic switch.

3. Remove two switch attaching screws and pull the sensing tube from the evaporator core.

INSTALLATION

1. Insert the thermostatic switch sensing tube into the evaporator core fins.

2. Position the thermostatic switch to the evaporator case and install the two attaching screws.

3. Connect the wires to the thermostatic switch.

4. Install the glove box liner and check the operation of the thermostatic switch.

EXPANSION VALVE—FALCON, FAIRLANE AND MERCURY INTERMEDIATE

1. Discharge the air conditioning system.

2. Remove the insulation and remove the sensing bulb from the compressor to evaporator line.

3. Disconnect the expansion valve from the evaporator and disconnect the valve from the valve to condenser line.

4. Position and connect the new valve to the evaporator.

5. Connect the condenser to valve line to the valve.

6. Install and insulate the sensing bulb.

7. Leak test, evacuate and charge the system. Check the system operation.

EXPANSION VALVE—MUSTANG AND COUGAR

REMOVAL

1. Remove the carburetor air cleaner.

2. Disconnect the hoses and remove the vacuum tank.

3. Remove the expansion valve heat shield.

4. Install a manifold gauge set and discharge the system (Section 3).

5. Disconnect the high pressure hose from the expansion valve.

6. Remove the expansion valve bulb from the clamp.

7. Remove the expansion valve from the evaporator core.

INSTALLATION

1. Install the expansion valve on the evaporator core fitting.

2. Position the expansion valve sensing bulb in the clamp and tighten the retaining screw.

3. Connect the high pressure hose to the expansion valve.

4. Wrap the insulation around the sensing bulb and expansion valve.

5. Install the expansion valve heat shield.

6. Install the vacuum tank and connect the vacuum hoses.

7. Install the carburetor air cleaner.

8. Leak test, evacuate, and charge the system (Section 3).

BLOWER MOTOR SWITCH—FALCON, FAIRLANE AND MERCURY INTERMEDIATE

1. Remove the air conditioning plenum to center register air duct.

Disconnect the plenum to right register air duct at the plenum and position it out of the way.

2. Remove the switch knob. Remove the switch mounting screw retaining the switch to the control assembly and lower the switch.

3. Disconnect the wires from the switch and remove the switch.

4. Connect the wires to the new switch and install it in the control assembly.

5. Install the two air ducts.

6. Install the switch knob and check the operation of the switch.

BLOWER MOTOR—FALCON, FAIRLANE AND MERCURY INTERMEDIATE

1. Remove the glove box.

2. Remove the right hand fresh air duct. Disconnect the vacuum line from the actuator and position it out of the way.

3. Disconnect the plug from the resistor block and remove the resistor block.

4. Remove the blower motor cover and remove the motor and blower wheel.

5. Remove the blower wheel and install it on the new motor.

6. Install the motor and wheel and ground wire in the heater case. Install the blower cover.

7. Connect the wires and install the resistor block to the plenum. Check the blower operation.

8. Install the fresh air duct.

9. Install the glove box.

A/C—HEAT DOOR VACUUM ACTUATOR—FALCON, FAIRLANE AND MERCURY INTERMEDIATE

1. Remove the glove box liner.

2. Remove the vacuum line at the actuator, and remove the defroster plenum chamber.

3. Remove the instrument panel lower and upper support.

4. Remove the speaker grille, the speaker mounting screws, and position the speaker out of the way.

5. Remove the defroster nozzle.

6. Disconnect the A/C plenum to right hand register air duct at the plenum and position it out of the way.

7. Disconnect the vacuum line from the actuator, remove the actuator mounting screws, disconnect the actuator to door lever arm at the lever and remove the actuator.

8. Install the new vacuum actuator and connect the actuator arm and vacuum line.

9. Connect the right hand register air duct.

10. Position and install the defroster nozzle.

11. Install the speaker and speaker grille.

12. Install the instrument panel upper and lower support.

13. Connect the red vacuum line to heat-defrost door vacuum actuator.

14. Install the glove box liner.

HEAT—DEFROST DOOR VACUUM ACTUATOR—FALCON, FAIRLANE AND MERCURY INTERMEDIATE

The defrost door vacuum actuator may be replaced after first removing the defroster plenum from the heater assembly.

After installing the new actuator, check its operation for full travel of the air door.

A/C-HEAT DOOR VACUUM ACTUATOR—MUSTANG AND COUGAR

REMOVAL

Remove the retaining clip from the A/C-heat door lever, two mounting screws, and remove the motor.

INSTALLATION

To install, position the motor and install the two mounting screws and the retaining clip to the A/C-heat door lever.

The outside recirculating air door and reheat door motor, water valve vacuum switch and the A/C thermostatic switch are accessible by removing the glove box liner.

HEATER TEMPERATURE CONTROL CABLE—MUSTANG AND COUGAR

REMOVAL

1. Disconnect the negative (ground) cable from the battery.

2. Remove the glove box liner.

3. Disconnect the cable at the blend air door.

4. Remove four screws and pull the heater control panel from the instrument panel.

5. Disconnect the temperature control cable from the control panel.

6. Connect a fish wire to the end of the control cable and pull the cable from under the instrument panel. Disconnect the fish wire from the cable.

INSTALLATION

1. Connect the fish wire to the new cable and pull the cable into position under the instrument panel.

2. Connect the cable to the control panel.

3. Connect the cable to the blend air door.

4. Position the control panel to the instrument panel and install the four attaching screws.

5. Check the cable for free operation and adjust the cable (Section 3).

6. Install the glove box liner and connect the battery ground cable.

HEATER WATER VALVE—MUSTANG AND COUGAR

REMOVAL

1. Drain the coolant from the cooling system.

2. Disconnect the vacuum hose from the water valve.

3. Disconnect the heater hoses from the water valve.

4. Remove the water valve and mounting bracket from the dash panel.

5. Remove the water valve from the bracket.

INSTALLATION

1. Install the water valve on the mounting bracket.

2. Position the water valve and bracket to the dash panel and install the two attaching screws.

3. Connect the heater hoses to the water valve.

4. Connect the vacuum hose to the water valve.

5. Fill the cooling system with coolant.

6. Check for leaks and for proper water valve operation.

CONDENSER—FALCON, FAIRLANE AND MERCURY INTERMEDIATE

1. Discharge the refrigerant from the system.

2. Remove the front grille to radiator support bracket, and the hood latch.

3. Disconnect the refrigerant lines from the condenser and receiver. Remove the condenser mounting screws and remove the condenser receiver assembly.

4. Position and mount the new condenser, remove the protective plugs, attach the refrigerant lines and install the grille to radiator support bracket and hood latch.

5. Check for leaks, evacuate and charge the system.

CONDENSER—MUSTANG AND COUGAR

REMOVAL

1. Install a manifold gauge set and discharge the system (Section 3).
2. Remove both horns.
3. Remove four bolts retaining the hood latch support to the radiator support.
4. Remove the hood bumpers and eight grille attaching screws.
5. Remove the radiator grille and hood latch support from the vehicle as an assembly.
6. Disconnect and cap the high pressure hoses from the condenser and the receiver tank.
7. Remove four condenser attaching screws and remove the condenser.
8. Remove the receiver tank from the condenser.

INSTALLATION

1. Install the receiver tank on the condenser.
2. Position the condenser to the vehicle and install the four attaching screws.
3. Connect the hoses to the receiver tank and the condenser.
4. Position the grille and hood latch support to the vehicle and install the grille attaching screws.
5. Install the hood latch support attaching bolts.
6. Install the horns.
7. Leak test, evacuate, and charge the A/C system (Section 3).

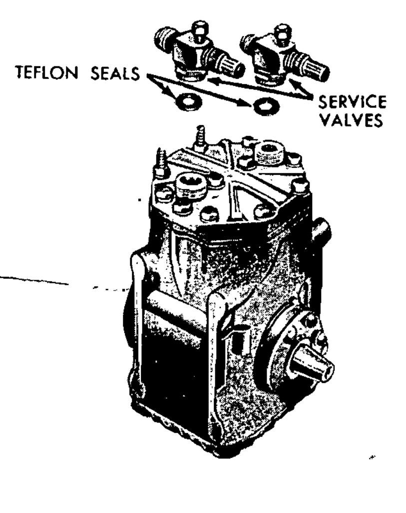


FIG. 20—Compressor Service Valves Removed

COMPRESSOR

REMOVAL

1. Isolate the compressor (See Common Adjustments and Repairs) and disconnect the two service valves and hoses from the compressor (Fig. 20). Energize the clutch and loosen and remove the clutch mounting bolt.

2. Install a 5/8-11 bolt in the clutch drive shaft hole. With the clutch still energized, tighten the bolt to loosen the clutch from the shaft. Disconnect the clutch wire at the bullet connector.

3. Loosen the idler pulley and remove the drive belt and the clutch and then remove the mounting bolts and the compressor.

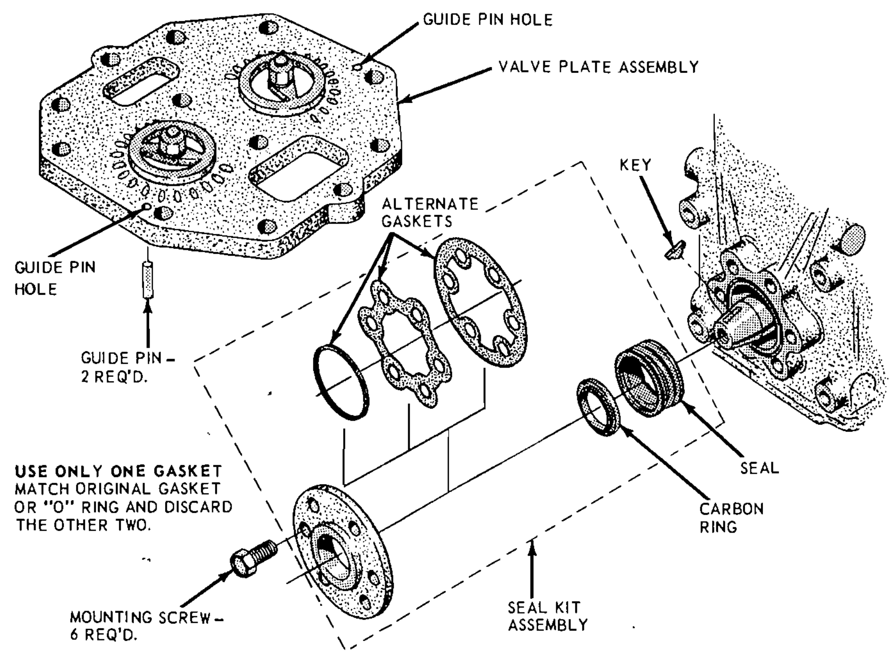


FIG. 21—Valve Plate and Crankshaft Seal Installation—York Compressor

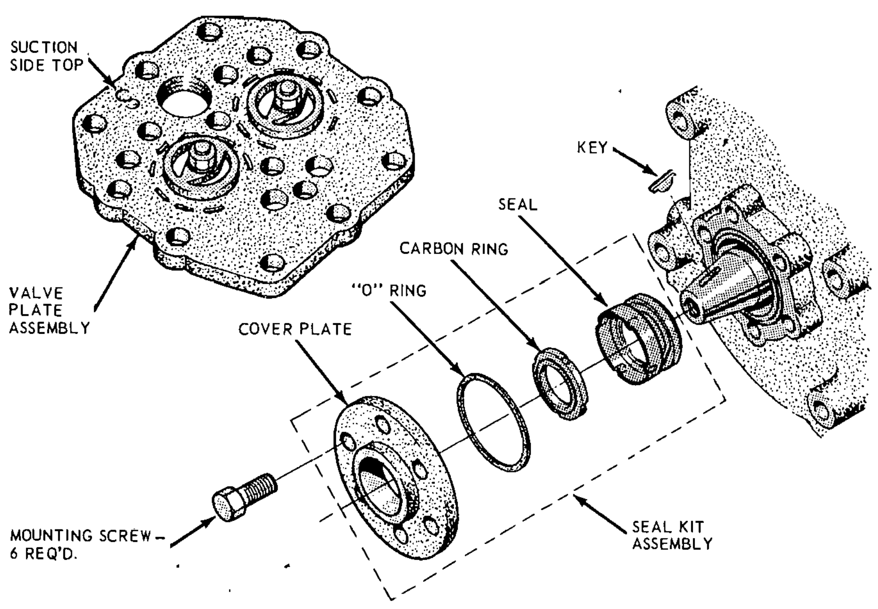


FIG. 22--Valve Plate and Crankshaft Seal Installation--Tecumseh Compressor

4. With the compressor on the work bench, remove the key from the shaft.

INSTALLATION

Before installing the compressor, see Cleaning and Inspection in this part.

1. Mount the clutch on the shaft and install the mounting screw and washer finger-tight. Place the compressor on the mounting bracket and install the four mounting bolts finger-tight.
2. Connect the clutch wire, energize the clutch and torque the clutch mounting bolt to specification. Install and tighten the mounting bolts to specification. Do not exceed torque specifications as misalignment can result.
3. Install the belt and adjust and tighten the idler pulley.
4. Install the service valves on the compressor using new seals. Be certain to remove the rubber shipping plugs first. Tighten the service valve nuts to specification. Do not over tighten. The new ROTO-LOK service valves can be rotated slightly on their seat without breaking the high pressure seal. This is not an indication of a loose valve. Leak test the compressor, then evacuate it and connect it back into the system.
5. Check the oil level in the compressor and add or remove oil if necessary (Section 3).

COMPRESSOR COMPONENTS

All compressor removal and installation operations, except belt replacement, can be performed only after the unit has been isolated from the rest of the system. (See Common Adjustments and Repairs.)

VALVE PLATE AND HEAD GASKET

The procedure for replacing a blown head gasket is identical to the procedure for replacing the valve plate except that the old valve plate is used. If a defective valve plate has caused the cylinder walls to become scored or has imbedded pieces of metal in the pistons, the compressor should be replaced.

Removal

1. Remove the compressor from the vehicle.
2. Remove the cylinder head bolts.
3. Remove the valve plate and cylinder head from the compressor by tapping upward with a fiber hammer on the overhanging edge of the valve plate.
4. Remove the valve plate from the cylinder head by holding the head and tapping against the valve plate.
5. Remove all particles of gasket, dirt and foreign material from the surface of the cylinder head and cylinder face. **Be extremely careful not to scratch or nick the mating surfaces or any edges.**

Installation (York Compressor—Fig. 21)

1. Apply a thin film of clean refrigeration oil to each side of the valve plate gasket (Fig. 21).
2. Place the new valve plate gasket in position on the crankcase so that the crankcase dowel pins go through the dowel pin holes in the gasket (Fig. 21).
3. Place the valve plate in position on the cylinder so that the dowel pins go through the dowel pin holes (Fig. 21).
4. Apply a light film of clean refrigeration oil on each side of the cylinder head gasket. Then, place the gasket and cylinder head on the cylinder with the dowel pins inserted into the dowel pin holes in the gasket and head.
5. Insert the two longer cap screws in the two center holes of the cylinder head. Then, insert the remaining cap screws in the holes around the edge of the cylinder head. The four 12 point head screws should be inserted into the four holes closest to the service ports.
6. Tighten all head cap screws until they contact the head. Then, torque the two center screws to 15-23 ft-lb. Tighten the remaining cap screws in a diagonal pattern to a torque of 15-23 ft-lb.
7. Install the compressor in the vehicle.
8. Connect the compressor to the system and purge the compressor. (See Isolating The Compressor in Section 3.) Then, check the compressor oil level and add or remove oil as required. (See Compressor Oil Level Check in Section 3.)

Installation (Tecumseh Compressor— Fig. 22)

1. Apply a thin film of clean refrigeration oil to each side of the valve plate gasket (Fig. 22).
2. Place the new valve plate gasket on the crankcase cylinder face.
3. Place the valve plate on the valve plate gasket so that the letter S (stamped on the valve plate) is on the same side of the crankcase as the word SUCTION.
4. Apply a thin film of clean refrigeration oil on each side of the head gasket.
5. Place the head gasket on the valve plate with the largest hole of the gasket over the largest hole of the valve plate. Line up the holes of the gasket with those of the valve plate.
6. Position the cylinder head on the compressor. **The word SUCTION on the head must be up and on the same side as the word SUCTION on the compressor crankcase.**
7. Align the bolt holes of the cylinder head, gaskets and valve plate with the holes in the compressor crankcase.
8. Install the cylinder head attaching bolts in the bolt holes. The four 12 point head bolts must be inserted in the four holes nearest the head service ports.
9. Tighten the bolts until they contact the top surface of the cylinder head. Then, tighten the head bolts in a sequence so that the bolts diagonally opposite each other are evenly tightened to a torque of 20-24 ft-lb.
10. Inspect the top of the cylinder head service valve ports to be sure that they are free of nicks and imperfections.
11. Replace the service valve port Teflon washers.
12. Install the compressor in the vehicle.
13. Connect the service valves to the correct ports and tighten to 35 ft-lb torque.
14. After the cylinder head has been installed 1/2 hour, retorque the head bolts to 20-24 ft-lb.
15. Isolate the compressor (Section 3), and check the compressor oil level (see Compressor Oil Level Check in Section 3).

CRANKSHAFT SEAL

Removal

1. Isolate the compressor, loosen and remove the belt.
2. Remove the clutch and remove the Woodruff key.
3. Carefully remove all accumulated dirt and foreign material from the seal plate and surrounding area of the compressor, and position a small drain pan beneath the seal plate.
4. Remove the seal plate bolts, and remove the plate and gasket. Do not mar the sealing surfaces, or the polished shaft surface.
5. Remove the carbon seal ring

and seal housing assembly from the crankshaft. A disassembled view of the crankshaft seal assembly is included in Figs. 21 and 22.

6. Clean all old gasket material from the seal plate and the compressor. Make certain that the shaft, the seal plate and the compressor gasket surfaces are completely clean before installing the new seal.

7. Check the face of the crankshaft front bearing journal in the seal housing to make certain that there are no nicks or burrs. Check the crankshaft surface to be sure that it is not damaged. Check all parts of the seal assembly to be sure that they are not damaged.

8. Inspect the compressor internal components for damage.

Installation—Tecumseh Compressor

1. Wash the new seal assembly components in clean refrigeration oil.

2. Coat the exposed surface of the crankshaft with clean refrigeration oil.

3. Place the seal (Fig. 22) over the compressor shaft with the end that fits the carbon ring facing out.

4. Position the carbon ring over the shaft and to the seal. **The raised rim of the carbon ring must face outward.**

5. Position the O-ring and seal plate cover to the compressor crankcase and align the cover attaching screw holes. Push the plate against the mating surface of the crankcase and install the six attaching screws. Torque the screws in a circular sequence to 6-10 ft-lb.

6. Rotate the shaft by hand 15 to 20 revolutions to seat the seal.

7. Make certain that there are no burrs or dirt on the compressor shaft. Then, install the key and magnetic clutch on the shaft.

8. Install the belt and adjust the tension to specification.

9. Check the compressor oil level (Section 3).

Installation — York Compressor

1. Wash the new seal assembly components in clean refrigeration oil.

2. Position the seal over the end of the shaft with the carbon ring retainer facing out. Move the seal in and out on the shaft a few times to insure a good seal between the seal and the shaft.

3. Push the seal all-the-way on the shaft. Be sure that the seal drive ring slots engage the drive pins on the shaft bearing journal face.

4. Place the carbon ring (Fig. 21) over the shaft and in the seal ring retainer. The polished surface of the carbon ring must face out and the lugs must engage the ring retainer and be fully seated.

5. Apply a light film of clean refrigeration oil on the matching faces of the crankcase and seal cover plate. Then, place the gasket in position on the crankcase face.

6. Place the seal cover plate in position (fig. 21), with the polished side facing the carbon ring. Then, install the cap screws. Tighten the cap screws evenly while turning the crankshaft. Be sure that the clearance between the crankshaft and the hole in the seal cover plate is even all around the shaft. If the clearance is not equal all around the shaft, gently tap the seal face into position until the clearance is equal. Then, tighten diagonally opposite cover plate attaching screws.

7. Make certain that there are no burrs or dirt on the compressor shaft. Then, install the key and magnetic clutch on the shaft.

8. Install the belt and adjust the tension to specification.

9. Check the compressor oil level (Section 3).

CLUTCH

1. Loosen and remove the belt.

2. Energize the clutch and loosen and remove the clutch mounting bolt.

3. Install a 5/8-11 bolt in the clutch drive shaft hole. With the clutch still energized, tighten the bolt to loosen the clutch from the shaft, then remove the magnetic clutch.

4. Install the clutch, the clutch mounting bolt, and the washer.

5. Energize the clutch, and torque the bolt to specification.

6. Install and adjust the belt.

BELT

1. Loosen the idler pulley and remove the belt.

2. Place the new belt in position, and adjust the belt tension to specification, then tighten the idler pulley.

3. Check the belt alignment, and adjust it if necessary.

5 CLEANING AND INSPECTION

COMPRESSOR

On compressor clutch installations, carefully remove any burrs or dirt that may be on the compressor shaft. The shaft must be dry and brightly polished. Then install the key in the shaft.

When the compressor is disassembled, completely clean all surfaces of gasket shreds and foreign objects.

If the compressor shaft seal is being replaced, inspect the compressor crankshaft seal recess and clean out dirt or chips as required.

CONDENSER

Check surface of the condenser for accumulation of leaves, mud or other foreign material causing restricted air flow around the condenser fins.

INSUFFICIENT OR NO COOLING	**1.** Inoperative magnetic clutch. **2.** Inoperative blower motor, or switch. **3.** Obstructed air passages. **4.** Complete loss of charge. (No bubbles in sight glass at system start up.) **5.** Partial loss of charge. (Continuous bubbles in sight glass after start up.) **6.** Service valves improperly set (should be maximum counterclockwise). **7.** Inoperative vacuum servo. **8.** Compressor defective, or loose or broken compressor belt. **9.** Vacuum lines kinked, clogged, loose, or off. **10.** A/C thermostat defective. **11.** Clutch lead disconnected or broken. **12.** Expansion valve inoperative—stays open or closed. **13.** Plugs left in compressor under service valve (both gauges indicate the same pressure). **14.** Moisture in system. **15.** Vacuum lines kinked, clogged, loose, or off. **16.** Inoperative vacuum selector valve. **17.** Improper installation to the dash panel. **18.** Inoperative A/C clutch switch.
NOISY COMPRESSOR	**1.** Loose, torn, or misaligned belt. **2.** Loose clutch. **3.** Compressor loose on brackets or brackets loose on engine. **4.** Foreign material or damaged parts in compressor.
COMPRESSOR VIBRATION	**1.** Broken or loose mounting bracket, or compressor brace. **2.** Loose clutch. **3.** Loose belt.

FIG. 23—Air Conditioning Diagnosis Guide

PART 16-3— Speed Control

1 DESCRIPTION AND OPERATION

DESCRIPTION—COUGAR

The automatic speed control system is a driver operated speed regulating device designed for use on turnpike or other open road driving. It can be used to maintain a constant vehicle speed from 30 to 80 mph on both hilly or level roads. In no instance does the system restrict or affect available engine rpm or sacrifice performance.

The system consists of a speed control regulator assembly, a brake release relay, an ON-OFF switch, a two position turn signal lever (set-speed) switch, a servo assembly (bellows), upper and lower speedometer cables, and the necessary wires, vacuum hoses, and linkage to connect the components for proper operation (Fig. 1).

When the system is in operation, additional speed for passing can be obtained by depressing the accelerator. When the accelerator is released, the vehicle will return to the set speed automatically. This over-ride feature allows complete control of vehicle speed without disrupting the memory of the speed control system. If the brakes are applied, the memory of the system is cancelled and the speed must be reset.

The vehicle speed may also be controlled by use of the two position set-speed switch on the end of the turn signal lever (Fig. 1). Pressing the set-speed switch to the first detent activates the speed control system and **increases the vehicle speed as long as the switch is depressed to the first detent.** When the switch is released, the vehicle will maintain the new speed. When the set-speed switch is pressed to the coast position (second detent-all the way in), the system is disengaged until the button is released. The vehicle speed at the time of button release will be maintained providing it is above the minimum speed of 30 mph. The system can be shut off by the ON-OFF switch, located on the left side of the instrument panel, and/or the ignition switch.

OPERATION—COUGAR

When the ignition switch is on and the speed control ON-OFF switch is pulled out, electrical power is supplied to the turn signal lever set-speed switch and the speed control regulator assembly. Within the regulator assembly, electrical power is supplied to the vacuum solenoid valve coil but the coil is not energized. Electrical power is also supplied to energize the advance solenoid coil and the insulating coupling coil (clutch). When the advance solenoid coil is energized, the valve is held open allowing atmospheric air pressure to enter the servo assembly (bellows). When the insulated coupling coil (clutch) is energized, it magnetically picks up the metering orifice cover plate and opens the orifice for metering.

The vehicle speed is transmitted to the speed control regulator with a speedometer cable connected to the transmission. As the speed of the vehicle is increased, hinged flyballs are forced outward by centrifugal force. As the vehicle speed reaches approximately 30 mph, the flyballs cause the low speed switch points to close and complete the electrical circuit to the vacuum solenoid valve coil. This opens the manifold vacuum valve, allowing vacuum to be drawn from the servo assembly (bellows).

When the vehicle speed reaches 30 mph or faster, the set-speed button can then be depressed to the first detent for speed control operation. When the button is depressed, the advance solenoid coil is de-energized. This closes the valve, blocking the atmospheric air pressure port to the bellows. At the same time, the insulated coupling coil (clutch) is de-energized and the cover plate is dropped over the metering orifice. These two solenoids cause the interior of the bellows to be closed to atmospheric air pressure. As vacuum is increased in the servo assembly (bellows), the bellows are compressed and regulate the carburetor throttle linkage to increase the vehicle speed.

After the desired vehicle speed has been reached, the set-speed button should be released. When the button is released, the advance solenoid coil is again energized and opens the valve, allowing entry of atmospheric air pressure to the bellows. At the same time, the insulated coupling coil (clutch) is also energized and picks up the metering orifice cover plate. This allows a metered amount of atmospheric air pressure to equalize vacuum in the bellows and stabilize the set vehicle speed.

If the vehicle speed is reduced as when climbing a hill, the insulated coupling coil (clutch) is actuated by vehicle speed and will reduce the orifice opening size. This will restrict the entry of atmospheric air pressure and increase the vacuum drawn from the bellows, thereby increasing the carburetor throttle plate opening and vehicle speed. As the vehicle speed is increased, as when decending a hill, the reaction of the clutch is the opposite and the orifice size is increased. This allows more atmospheric air pressure to enter the bellows and reduces the carburetor throttle plate opening and vehicle speed until the desired speed setting is attained.

When the brakes are applied, the stop light switch contacts are closed and the brake release relay is ener-

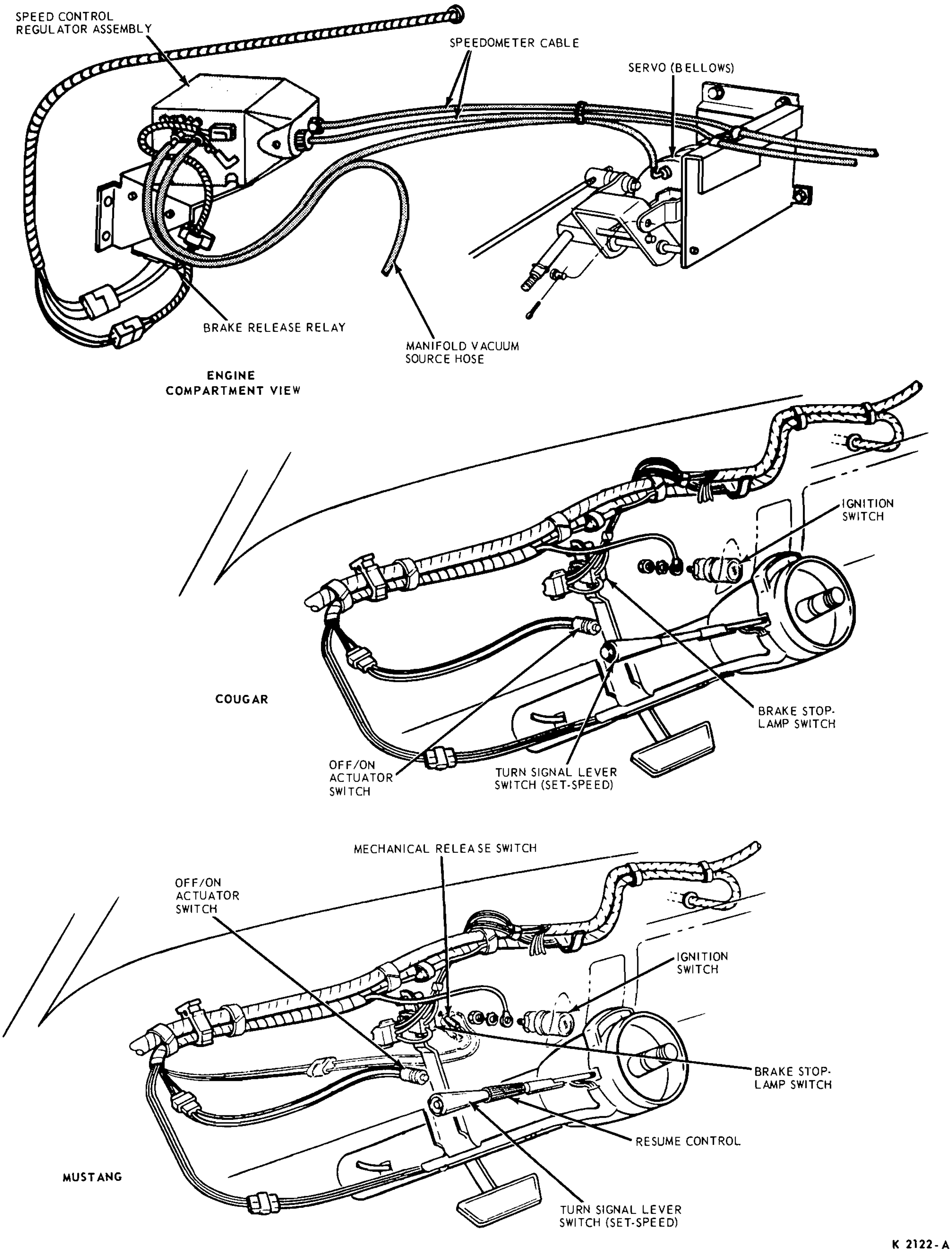


FIG. 1—Speed Control Installation—Mustang and Cougar

gized. This de-energizes the vacuum solenoid valve coil and the valve closes the vacuum passage to the bellows. This releases the carburetor linkage to manual control by the accelerator pedal. The coast position (second-detent) of the set-speed switch also de-energizes the vacuum solenoid valve coil to reduce speed. When the button is released from the coast position, it travels through the set-speed position. This automatically sets the speed control for the speed of the vehicle at the time of release, providing the speed of the vehicle is not less than approximately 30 mph.

DESCRIPTION—MUSTANG

The automatic speed control system is a driver operated speed regulating device designed for use on turnpike or other open road driving. It can be used to maintain a constant vehicle speed from 30 to 80 mph on both hilly or level roads. In no instance does the system restrict or affect available engine rpm or sacrifice performance.

The system consists of a speed control regulator assembly, a brake release relay, an ON-OFF switch, turn signal lever (set-speed and resume) switch, a servo assembly (bellows), upper and lower speedometer cables, and the necessary wires, vacuum hoses, and linkage to connect the components for proper operation (Fig. 1).

When the system is in operation, additional speed for passing can be obtained by depressing the accelerator. When the accelerator is released, the vehicle will return to the set speed automatically. This over-ride feature allows complete control of vehicle speed without disrupting the memory of the speed control system. If the brakes are applied, the speed must be reset with the set-speed switch at any desired speed or the vehicle can be returned to the same preset speed with the resume switch.

The vehicle speed may also be controlled by use of the set-speed switch on the end of the turn signal lever (Fig. 1). Pressing the set-speed switch activates the speed control system and increases the vehicle speed as long as the switch is depressed. When the switch is released, the vehicle will maintain the new speed. The system can be shut off by the ON-OFF switch, located on the left side of the instrument panel, and/or the ignition switch.

OPERATION—MUSTANG

When the ignition switch is on and the speed control ON-OFF switch is pulled out, electrical power is supplied to the turn signal lever set-speed switch and the speed control regulator assembly. Within the regulator assembly, electrical power is supplied to the vacuum solenoid valve coil but the coil is not energized. Electrical power is also supplied to energize the advance solenoid coil and the insulating coupling coil (clutch). When the advance solenoid coil is energized, the valve is held open allowing atmospheric air pressure to enter the servo assembly (bellows). When the insulated coupling coil (clutch) is energized, it magnetically picks up the metering orifice cover plate and opens the orifice for metering

The vehicle speed is transmitted to the speed control regulator with a speedometer cable connected to the transmission. As the speed of the vehicle is increased, hinged flyballs are forced outward by centrifugal force. As the vehicle speed reaches approximately 30 mph, the flyballs cause the low speed switch points to close and complete the electrical circuit to the vacuum solenoid valve coil. This opens the manifold vacuum valve, allowing vacuum to be drawn from the servo assembly (bellows).

When the vehicle speed reaches 30 mph or faster, the set-speed button can then be depressed to the first detent for speed control operation. When the button is depressed, the advance solenoid coil is de-energized. This closes the valve, blocking the atmospheric air pressure port to the bellows. At the same time, the insulated coupling coil (clutch) is de-energized and the cover plate is dropped over the metering orifice. These two solenoids cause the interior of the bellows to be closed to atmospheric air pressure. As vacuum is increased in the servo assembly (bellows), the bellows are compressed and regulate the carburetor throttle linkage to increase the vehicle speed.

After the desired vehicle speed has been reached, the set-speed button should be released. When the button is released, the advance solenoid coil is again energized and opens the valve, allowing entry of atmospheric air pressure to the bellows. At the same time, the insulated coupling coil (clutch) is also energized and picks up the metering orifice cover plate. This allows a metered amount of atmospheric air pressure to equalize vacuum in the bellows and stabilize the set vehicle speed.

If the vehicle speed is reduced as when climbing a hill, the insulated coupling coil (clutch) is actuated by vehicle speed and will reduce the orifice opening size. This will restrict the entry of atmospheric air pressure and increase the vacuum drawn from the bellows, thereby increasing the carburetor throttle plate opening and vehicle speed. As the vehicle speed is increased, as when decending a hill, the reaction of the clutch is the opposite and the orifice size is increased. This allows more atmospheric air pressure to enter the bellows and reduces the carburetor throttle plate opening and vehicle speed until the desired speed setting is attained.

When the brakes are applied, the stop light switch contacts are closed and the brake release relay is energized. This de-energizes the vacuum solenoid valve coil and the valve closes the vacuum passage to the bellows. This releases the carburetor linkage to manual control by the accelerator pedal. Activating the resume speed switch at speeds of approximately 30 mph or faster will energize the vacuum solenoid valve coil and return the vehicle to the previous set speed. When the resume switch is not applied, the vehicle speed will decrease and must be reset using the normal speed set procedure.

2 DIAGNOSIS AND TESTING

DIAGNOSIS

Refer to Fig. 2 at the end of this part for the diagnosis guide on speed control units. The wiring schematics are shown in Group 19.

Functional evaluation of speed control systems **must not** be conducted while the vehicle is on a hoist or when the rear wheels are off the ground. The no load condition will cause hunting or oscillations of the vehicle speed and will prevent proper diagnosis of the speed control system.

TESTING

1. FEED WIRE TO THE BRAKE RELEASE RELAY TEST—WIRE FROM STOPLIGHT SWITCH TO THE BLUE/WHITE WIRE ON THE SPEED CONTROL BRAKE RELEASE RELAY.

With the test lamp connected between ground and the blue/white wire terminal at the brake release relay, depress the brake pedal. The test lamp should light.

If the test lamp fails to light, a problem exists in the wiring from the stoplight switch to the speed control brake release relay.

2. SPEED CONTROL BRAKE RELEASE RELAY TEST.

With the test lamp connected between the positive battery post and the black/orange wire terminal on the brake release relay, the test lamp should light. When the brake pedal is depressed, the test lamp should go out.

If the test lamp fails to go out when the brake pedal is depressed and test No. 1 proves good, then the brake release relay is at fault and requires replacement.

3. FEED WIRE FROM THE ON-OFF SWITCH TO THE TURN SIGNAL LEVER SET-SPEED SWITCH (BUTTON) TEST

Disconnect the wiring from the turn signal lever set-speed switch below the instrument panel (GREEN connectors). Connect the test lamp between ground and the RED wire of the main harness feed. With the ignition key in the ACC position, pull the ON-OFF switch (in the ON-OFF panel). When the switch is pulled the test lamp should light.

If the test lamp fails to light, an open circuit exists in the red wire from the ON-OFF switch to the connector feeding the turn signal lever set-speed switch.

4. SPEED CONTROL REGULATOR TEST

With the ignition key in the ACC position and the ON-OFF switch pulled out, partially disconnect the multiple plug connector attached to the speed control regulator:

A. With a test lamp connected between ground and the No. 3 terminal of the regulator (terminals are numbered on the regulator), the test light should light.

B. Connect the test lamp between ground and the No. 2 terminal of the regulator. When the set-speed button (at the end of the turn signal lever) is depressed to the first detent, the test lamp should light.

If (Speed Control Regulator) tests A or B fail and tests 1 through 3 prove good, then the speed control regulator is at fault and requires replacement.

THE SPEED CONTROL REGULATOR ASSEMBLY SHOULD NOT BE DISASSEMBLED, ADJUSTED OR SERVICED IN ANY WAY EXCEPT FOR COMPLETE REGULATOR ASSEMBLY REPLACEMENT.

5. VACUUM SUPPLY HOSE TEST--VACUUM GAUGE REQUIRED

With the engine at idle speed, disconnect the vacuum supply hose (Black/Red) from the speed control regulator assembly. Vacuum reading should be 14 to 18 inches at the regulator end of the supply hose. If the vacuum supply is below 14 inches, check for the following problems and repair as required.

A. Leaking and/or kinked vacuum supply hose.

B. Poor hose connections at the vacuum source.

C. Poor engine vacuum supply.

6. SERVO (BELLOWS) ASSEMBLY AND VACUUM HOSE TEST

Disconnect the bellows supply vacuum hose from the speed control regulator assembly. Manually compress the bellows assembly and close the end of the vacuum hose. If the bellows does not remain compressed, with the vacuum hose closed, check for the following problems and repair as required.

A. Leaking vacuum hose.

B. Loose vacuum hose connection at the bellows assembly.

C. Leaking bellows assembly.

3 REMOVAL AND INSTALLATION

ON-OFF SWITCH

REMOVAL

1. Loosen the knob set screw and remove the knob from the switch.
2. Remove the bezel nut from the switch and remove the switch from the instrument panel.
3. Disconnect the switch wires at the multiple connector.

INSTALLATION

1. Connect the switch wires at the connector.
2. Position the switch to the instrument panel and install the bezel nut.
3. Position the knob on the switch shaft and tighten the knob set screw.

TURN SIGNAL LEVER (SET-SPEED) SWITCH

REMOVAL

1. Disconnect the switch wires at the multiple connector.
2. Remove three screws attaching the wiring trim cover to the steering column and remove the cover.
3. Unscrew and remove the turn signal switch lever from the steering column.

INSTALLATION

1. Install the turn signal switch lever in the steering column.
2. Position the wiring trim cover over the wires and to the steering column. Then, install the three attaching screws.
3. Connect the wires at the connector.

SPEED CONTROL REGULATOR

REMOVAL

1. Disconnect the manifold and servo control vacuum hoses from the regulator. Install the protective caps or covers on the vacuum hoses and hose connections of the regulator.
2. Disconnect the speedometer cables from the regulator.
3. Disconnect the wire connectors from the regulator and separate the harness from the regulator and brake release relay.
4. Remove two regulator mounting bracket attaching bolts and remove the regulator and bracket from the vehicle.
5. Remove the regulator from the mounting bracket.

INSTALLATION

1. Attach the regulator to the mounting bracket.
2. Position the regulator and mounting bracket to the vehicle and install the two attaching bolts.
3. Connect the wire connectors and harness to the regulator and brake release relay.
4. Connect the speedometer cables to the regulator.
5. Connect the vacuum hoses to the regulator.

BRAKE RELEASE RELAY

REMOVAL

1. Disconnect the electrical connector plug from the relay.

2. Remove the ground wire retaining screw.

3. Remove two relay attaching screws and remove the relay.

INSTALLATION

1. Position the relay to the mounting bracket and install the two attaching screws.

2. Connect the ground wire and connector plug to the relay.

SERVO ASSEMBLY (BELLOWS)

REMOVAL

1. Disconnect the vacuum hose from the servo. Plug the vacuum hose and cap the hose connection of the servo.
2. Remove the cotter pin and clevis pin connecting the servo assembly to the throttle linkage.
3. Remove the servo retaining nut from the servo bracket.
4. Compress the servo bellows and remove the servo from the mounting bracket.

INSTALLATION

1. Position the servo to the mounting bracket and install the retaining nut.
2. Position the servo to the throttle linkage and install the clevis pin and cotter pin.
3. Connect the vacuum hose to the servo.

Trouble	Possible Cause	Corrective Action
SYSTEM WILL NOT OPERATE WHEN SYSTEM IS TURNED ON	1. Fuse blown. 2. Defective wiring. 3. Defective on/off switch.	1. Replace fuse. 2. Repair wiring. 3. Replace switch.
SWITCH WORKS BUT SYSTEM WILL NOT OPERATE	1. Defective wiring. 2. Defective brake release relay. 3. Defective brake stop light switch. 4. Defective turn signal lever switch (set-speed switch). 5. Defective speed control regulator. 6. Defective (ruptured) vacuum bellows. 7. Frozen/locked servo, accelerator, or carburetor linkage. 8. Defective speedometer cable (lower) between transmission speed control regulator. 9. Defective speedometer drive or driver gear.	1. Repair wiring. 2. Replace relay. 3. Replace switch. 4. Replace switch. 5. Replace speed control regulators. 6. Replace bellows. 7. Adjust and remove binding conditions in linkage. 8. Replace lower speedometer cable. 9. Replace speedometer drive or driver gear.
SYSTEM HUNTS (SPEED CONTINUOUSLY CHANGES UP AND DOWN).	1. Ruptured or loose vacuum hose between manifold and speed control regulator bellows. 2. Ruptured bellows. 3. Defective speed control regulator. 4. Sticky accelerator, carburetor or servo linkage. 5. Defective wiring. 6. Defective turn signal lever switch. 7. Defective resume switch.	1. Replace defective hoses and/or secure connections as required. 2. Replace bellows. 3. Replace speed control regulator. 4. Adjust and remove binding conditions in linkage. 5. Repair wiring. 6. Replace switch. 7. Replace switch.

FIG. 2—Speed Control Diagnosis Guide

Trouble	Possible Cause	Corrective Action
SYSTEM SLUGGISH OR WILL NOT HOLD SPEED ON HILLS	1. Defective speed control regulator. 2. Sticking or binding linkage. 3. Vacuum leak in hoses, bellows or kinked vacuum hoses.	1. Replace speed control regulator. 2. Adjust and remove binding conditions in linkage. 3. Check vacuum hoses, fittings bellows for leaks and/or proper routing.
SYSTEM OPERATIVE BUT SPEEDOMETER DOES NOT REGISTER	1. Upper speedometer cable between speed control regulator and speedometer defective. 2. Defective speedometer head. 3. Defective speed control regulator.	1. Replace upper speedometer cable. 2. Replace speedometer head. 3. Replace speed control regulator.
SYSTEM REMAINS ENGAGED WHEN BRAKE IS DEPRESSED BELOW 25 MPH	1. Defective brake stop light switch. 2. Defective brake release relay. 3. Defective speed control regulator. 4. Defective wiring. 5. Defective set-speed (turn signal lever) switch.	1. Replace switch. 2. Replace relay. 3. Replace speed control regulator. 4. Repair wiring. 5. Replace switch.
SYSTEM REMAINS ENGAGED AFTER OFF BUTTON IS DEPRESSED	1. Defective off switch. 2. Defective wiring.	1. Replace off switch. 2. Repair wiring.
VEHICLE SPEED INCREASES GRADUALLY AFTER INITIAL SET SPEED	1. Defective speed control regulator. 2. Defective turn signal lever (set-speed) switch. 3. Defective speed control regulator. 4. Defective wiring.	1. Replace speed control regulator. 2. Replace switch. 3. Replace regulator. 4. Repair wiring.
LOW SPEED SETTING TOO HIGH	1. Low speed switch out of adjustment. 2. Defective speed control regulator.	1. Replace speed control regulator. 2. Replace speed control regulator.
SYSTEM RETAINS ITS MEMORY AFTER ENGINE IS SHUT DOWN AND RESTARTED	1. Defective speed control regulator. 2. Frozen or binding throttle linkage.	1. Replace speed control regulator. 2. Repair or replace as required.
SYSTEM CONTINUES TO OPERATE AFTER SPEED IS COMPLETELY DECREASED	1. Defective speed control regulator. 2. Defective turn signal lower switch (set-speed). 3. Defective wiring. 4. Defective brake release relay.	1. Replace speed control regulator. 2. Replace set-speed switch. 3. Repair wiring. 4. Replace relay.
SPEED CONTINUES TO INCREASE AFTER TURN SIGNAL LEVER (SET-SPEED) SWITCH IS RELEASED	1. Defective turn signal lever (set-speed) switch. 2. Defective speed control regulator. 3. Defective wiring. 4. Defective holding relay.	1. Replace switch. 2. Replace regulator. 3. Repair wiring. 4. Replace relay.

FIG. 2—Speed Control Diagnosis Guide (Continued)

PART 16-4— *Radio*

1 DESCRIPTION AND OPERATION

DESCRIPTION

MUSTANG AND COUGAR

The radio is located in the center lower section of the instrument panel on all models so equipped. Three basic radio systems are available; an AM radio, AM-FM radio, and an AM radio-stereo tape player (Fig. 1).

The front speaker is located in the center of the instrument panel above the radio. Service of this speaker must be done from under the instrument panel. The stereo speakers for Mustang models are located in the lower front corner of each door trim panel. The stereo speakers for Cougar models are located in the cowl side panels.

FALCON, FAIRLANE AND MERCURY INTERMEDIATE

The radio is located in the right side of the instrument cluster on models so equipped. An AM radio and a hang-on stereo tape player are available for Falcon and Fairlane models. An AM and AM-FM radio and a hang-on stereo tape player are available in Mercury Intermediate models (Fig. 1).

The front speaker is located in the center of the instrument panel above the radio. The speaker is serviced through the glove box opening. The stereo speakers are located one in each side cowl panel and two are located in the rear package tray.

OPERATION

AM RADIO

The left knob of the radio is the on-off switch and volume control. Turning the knob clockwise turns the radio on and increases the volume. The ring knob behind the on-off volume control is the tone control. Clockwise rotation increases the tone control to treble. Counterclockwise rotation increases the bass tone.

The right knob on the radio is the manual tuning control. Tuning can also be accomplished to pre-set stations with any one of the five push buttons located below the radio dial. Refer to Section 3 for the push button adjustment procedure.

AM-FM RADIO

The manual knob controls of the AM-FM radio are the same as the AM radio. Tuning can be accomplished to an AM or FM pre-set station by the five push buttons located below the radio dial. A slide bar above the push buttons indicates if the radio is set for AM or FM band reception. When an FM button is depressed, the slide bar moves to uncover the letters FM at the left of the bar, provided the radio is not already set for FM band reception. When an AM button is depressed, the slide bar moves to uncover the letters AM at the right side of the slide bar, providing the radio is not already set for AM band reception. Band switching may also be accomplished by sliding the band bar sideways to uncover the letters

Vehicle	Model Identification			
	AM Radio	AM/FM Radio	Stereo Tape Player (Hang-On)	AM Radio-Stereo Tape Player
Mercury Intermediate	Philco 7TPG	Bendix F7TBG	Motorola T7SMH/N ①	–
Cougar	Philco 7TPG	Bendix F7TBG	Motorola T7SMH/F ①	Motorola T7SMW
Falcon	Philco 7TPD	–	Motorola T7SMH/N ①	–
Fairlane	Philco 7TPO	–	Motorola T7SMH/N ①	–
Mustang	Philco 7TPZ	Bendix F7TBZ	Motorola T7SMH/F ①	Motorola T7SMZ

① Motorola T7SMH/A is used with air conditioned equipped vehicles.

FIG. 1—Radio Model Identification

indicating the desired band (AM or FM).

Vertical grooves on the face of each push button indicate which buttons are tuned for AM or FM band reception on Mustang models. If the vertical groove is on the left side of the button, the button is tuned for FM band reception. If the groove is on the right side, the button is tuned for AM band reception. On Mercury Intermediate and Cougar models, the letters AM or FM appear on the tapered edge of the button to indicate which band (AM or FM) the button is tuned for.

AM RADIO-STEREO TAPE PLAYER

The manual controls of the AM Radio-Stereo Tape Player are the same as the AM radio except for an optional fader control. The fader control (used only with rear seat speakers) is the ring knob located behind the manual tuning control. This control is used to balance the output of the front and rear speakers. The fader control can also be used to silence either the front or rear seat speakers.

The stereo tape cartridge opening is located below the radio dial. When the unit is turned ON and the cartridge is pushed all-the-way into the opening, the stereo tape player will be in operation. When the radio or ignition is turned OFF, the cartridge is automatically released from the play position. To engage the cartridge for tape player operation, push the cartridge all-the-way in and hold it momentarily.

HANG-ON STEREO TAPE PLAYER

The left knob of the stereo tape player is the volume control. To increase the volume, turn the knob clockwise. The ring knob located behind the volume control is the tone control. Rotating the ring knob clockwise increases the treble tone. Reversing the rotation increases the bass tone.

The right knob is the fader control. Turning the knob fades the sound from the front to rear speakers. When the knob is at the center of its rotation, the sound is distributed approximately equally from both the front and rear speakers.

The right ring knob is the balance control. Rotating the knob clockwise reduces the volume of the right speakers. Turning the knob counterclockwise increases the volume of the right speakers.

The stereo tape player will play all four channels of the cartridge automatically. However, a manual over ride is provided to allow program (channel) selection as desired. To change channels, push the volume control knob in and release it. The stereo tape player will change to the next channel.

To operate the stereo tape player, insert a tape cartridge, label side up and open end first, into the tape slot. Push the cartridge in until it is firmly seated. This will turn the unit on and will play all four channels in succession. To turn the unit off, pull the cartridge out approximately one inch or completely remove it from the tape slot. When the stereo tape player is not in use, the radio output can be played through the rear seat speakers.

2 DIAGNOSIS AND TESTING

DIAGNOSIS

Refer to Fig. 5 for the radio trouble diagnosis guide.

TESTING

Tests for any of the components in the radio system may be made by substituting known good parts. In the case of an antenna or speaker, it will not be necessary to remove the suspected antenna or speaker. Disconnect the antenna or speaker at the radio and plug in the known good unit. Check the antenna with the vehicle outside of the garage. Plug the antenna lead into the antenna socket in the radio, and extend the antenna wand through the open window of the vehicle.

3 COMMON ADJUSTMENTS AND REPAIRS

PUSH BUTTON ADJUSTMENT—AM-RADIO

Turn the radio on, and allow it to warm up for 15 minutes. Extend the antenna to a height of approximately 33 inches. Pull out the push button to be set, to unlock the push button mechanism. Carefully tune in the desired station with the manual tuning knob. After the station is clearly tuned in, push the button straight in until it stops and then release it. Repeat this procedure for the remaining buttons.

PUSH BUTTON ADJUSTMENT—AM-FM RADIO

To set the AM/FM radio selector buttons for FM reception:

1. Extend the antenna to a height of approximately 33 inches. Then, turn the radio ON.
2. Slide the AM/FM selector bar to the right.
3. Pull out a button.
4. Rotate the button so that the vertical groove is on the left side of the button (Mustang) or the letters FM are showing on the buttons upper tapered edge (Cougar and Mercury Intermediate).
5. Manually dial the station desired.
6. Push in the button as far as it will go.

To set the AM/FM radio selector buttons for AM reception:

1. Turn on the radio.
2. Slide the AM/FM selector bar to the left.
3. Pull out a button.
4. Rotate the button so that the vertical groove is on the right side of the button.
5. Manually dial the station desired.
6. Push in the button as far as it will go.

STEREO TAPE HEAD CLEANING

After extended use, a deterioration of stereo tape playback fidelity may be encountered. This is usually caused by an oxide coating. During normal operation, some iron oxide particles are loosened from the tape and build up on the head and drive capstan. It may take several hundred hours of operation to reach

this condition. The head should be cleaned whenever the sound deteriorates. This can be done either in the vehicle or on the bench.

To clean the tape head, moisten a cotton swab with isopropyl alcohol and clean the surface of the head. To clean the capstan, turn the unit ON and depress the switch with the eraser end of a pencil to operate the capstan as shown in Fig. 2. While the capstan is rotating, contact the shaft surface lightly with the swab. Wipe the parts dry with a clean cloth after cleaning.

Caution should be exercised when cleaning, to prevent getting alcohol on any of the plastic parts. **Do not use carbon tetrachloride.**

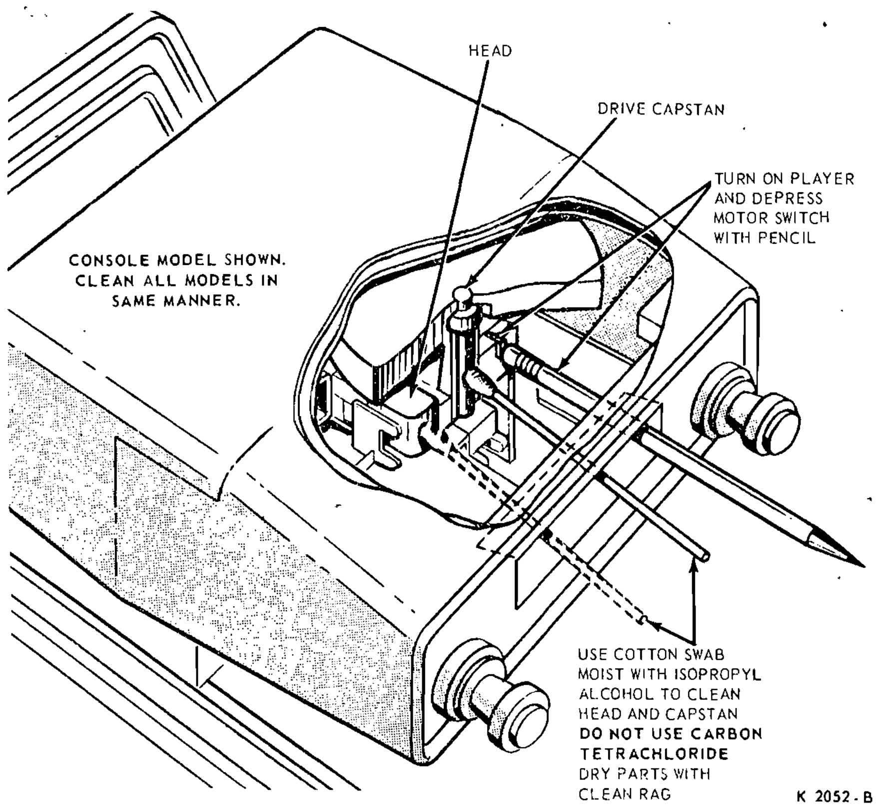


FIG. 2—Cleaning Tape Head

4 REMOVAL AND INSTALLATION

RADIO RECEIVER

FALCON, FAIRLANE AND MERCURY INTERMEDIATE

Removal

To remove the radio receiver, proceed as follows:

1. Disconnect the negative cable.
2. Pull the radio control knobs off and remove the nuts and washers that attach the radio to the instrument panel.
3. Disconnect the antenna lead at the right side of the radio (at the back of the AM-FM radio).
4. Disconnect the speaker lead.
5. Disconnect the radio lead wire and the dial light wire from the quick disconnects.
6. Remove the radio support bracket.
7. Remove the radio assembly from the instrument panel.

Installation

1. Position the radio to the instrument panel, and then install the washers and attaching nuts at the knob shafts. Be sure that the radio mounting stud enters the support bracket.
2. Install the radio support bracket. Torque all mounting nuts to specification.
3. Connect the antenna lead to the radio.
4. Connect the radio speaker lead.
5. Connect the radio power lead and the dial light lead.
6. Install the radio control knobs.
7. Connect the negative cable to the battery.
8. Check the radio operation.

MUSTANG AND COUGAR—WITHOUT CONSOLE

Removal

1. Disconnect the negative cable from the battery.
2. Remove the rear support bracket attaching nut.
3. Remove four screws that attach the bezel and receiver to the instrument panel.
4. Move the receiver rearward away from the instrument panel. Disconnect the antenna, speaker and power leads and remove the receiver from the instrument panel.

Installation

1. Transfer the bezel and knobs to the new receiver.
2. Position the radio under the instrument panel and connect the speaker, antenna and power leads.
3. Secure the receiver to the instrument panel with the attaching screws.
4. Secure the rear support bracket to the receiver with the attaching nut.
5. Connect the negative cable to the battery.
6. Check the operation of the radio. Set the station selector knobs and trim the antenna as required.

MUSTANG AND COUGAR—WITH CONSOLE

Removal

1. Disconnect the negative cable from the battery.
2. Remove two screws attaching the right and left supports to the support bracket.
3. Remove the console assembly.
4. Disconnect the radio wiring and antenna lead.
5. Remove the control knobs from the radio.

6. Remove the two nuts and washers from around the radio shafts and remove the radio.

Installation

1. Position the radio to the opening and install the washers and nuts around the radio control shafts.
2. Install the control knobs.
3. Connect the radio wires and antenna lead in cable.
4. Install the console assembly.
5. Install the two screws attaching the right and left support to the support bracket.
6. Connect the negative cable to the battery.

STEREO TAPE PLAYER

Removal

1. Disconnect the two speaker leads from the multiple connectors at the rear of the stereo tape player.
2. Disconnect the power lead from the fuse holder and remove the fuse.
3. Remove the tape player attaching bolts and remove the player.

Installation

1. Transfer the discs, knobs and trim cover to the new tape player.
2. Position the tape player and install the attaching bolts.
3. Connect the two speaker leads to the multiple connectors.
4. Place the fuse in the holder and connect the tape player power lead.
5. Check the tape player operation.

ANTENNA—FALCON, FAIRLANE AND MERCURY INTERMEDIATE

1. Disconnect the antenna lead from the side of the radio receiver (at the back of the AM-FM radio). Tie a string to the end of the antenna lead.
2. Remove the antenna cap, four screws, and remove the antenna assembly.
3. Tie the string to the new antenna lead.
4. Position the antenna assembly in the opening, put the spacer in position on the antenna and install the antenna.
5. Pull the antenna lead through the opening and route the lead under the glove box and connect the lead to the radio.

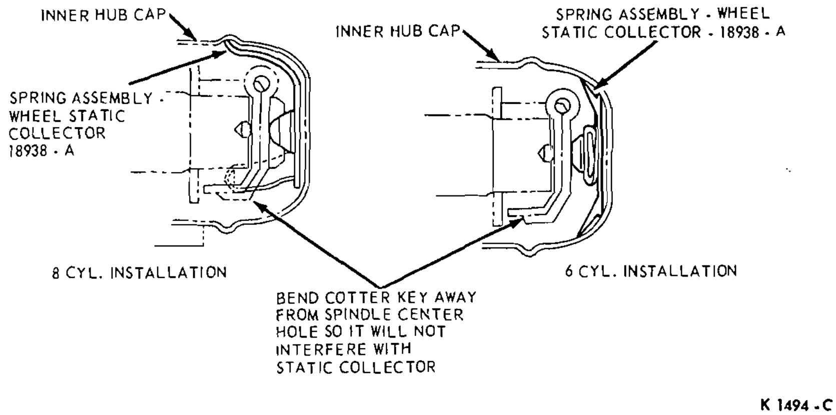


FIG. 3—Radio Interference Suppression—Except Fairlane

ANTENNA—MUSTANG AND COUGAR

1. Disconnect the antenna lead from the radio, position it to the right side and remove the grommet.
2. Remove the antenna mounting nut and spacer, remove antenna and retainer assembly from the fender.
3. Feed the antenna lead through the fender and side cowl panel holes, position the antenna, the antenna retainer, spacer, and install the antenna mounting nut.
4. Route the antenna lead to the radio and install it in the retaining clips.
5. Connect the lead to the radio, install the grommet and check the radio operation.

FRONT SPEAKER—FALCON AND FAIRLANE

1. Disconnect the speaker wires from the radio receiver.
2. Remove the glove box.
3. Remove the speaker attaching nuts and remove the speaker through the glove box opening.
4. Install the new speaker through the glove box to the instrument panel and secure it with attaching nuts.
5. Connect the speaker leads to the radio and check the radio operation.

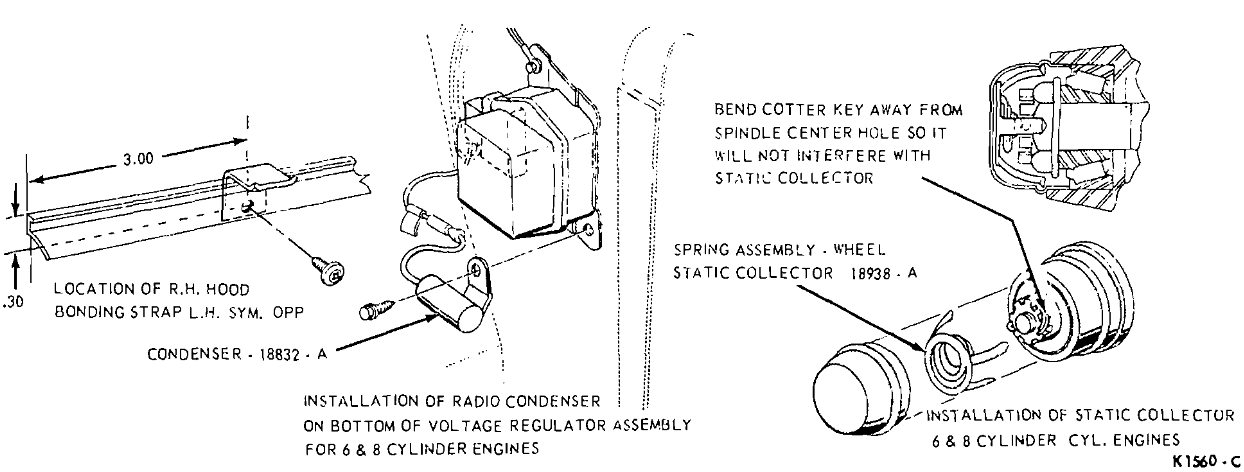


FIG. 4—Fairlane Radio Interference Suppression

6. Install the glove box.

REAR SPEAKER—FALCON AND FAIRLANE

The rear seat speaker is accessible for replacement from the luggage compartment. On the station wagon the speaker is mounted on the left rear trim panel. Remove the trim panel to replace the speaker.

FRONT SPEAKER—MUSTANG AND COUGAR

1. Disconnect the negative cable from the battery.
2. Remove the radio from the instrument panel and position it on the floor pan.
3. On an air conditioned vehicle, it will be necessary to disconnect the center register duct and the defroster duct.
4. Disconnect the speaker lead from the radio. Remove the two speaker attaching nuts and remove the speaker out through the radio opening in the panel.
5. Connect the speaker lead to the radio.
6. Working through the radio opening, position the speaker to the panel and install the two attaching nuts.
7. Position the radio and install the attaching screws.
8. Position the rear support brace and install the attaching nut to the rear of the radio.
9. Connect the negative cable to the battery.
10. Check the operation of the radio.

INTERFERENCE SUPPRESSION

Interference suppression items are shown in Fig. 3. An alternator condenser is an internal part of the alternator to suppress electrical interference in the radio. Wheel static collectors are also used. An instrument voltage regulator choke and a hood bonding clip are used on the Mercury Intermediate only. Interference suppression items used on the Fairlane are shown in Fig. 4.

NO RECEPTION	1. Burned out fuse. 2. Defective antenna. 3. Shorted speaker lead or defective speaker. 4. Reversed battery polarity. Make certain that voltage is available at the A lead (12 volts), then substitute a known good antenna and speaker. **Be sure to turn off the radio receiver before removing or installing the speaker.** If the radio still will not play, remove the receiver for a major repair.
NOISY OR ERRATIC RECEPTION	NOISY RECEPTION—ENGINE NOT RUNNING 1. Loose connections. NOISY RECEPTION—ENGINE RUNNING 1. Defective suppression equipment. 2. Suppression condensers not properly grounded. 3. Receiver not properly grounded to the instrument panel. NOISY RECEPTION—VEHICLE IN MOTION 1. Loose or broken lead-in cable. 2. Loose or defective radio antenna. 3. Defective wheel static collector.
DISTORTED OR GARBLED SOUND	1. Voice coil rubbing on center pole piece of speaker magnet. 2. Torn speaker cone. 3. Foreign material on cone. 4. Bent or twisted speaker mounting. **Be sure to turn off the radio receiver before removing or installing the speaker.**
WEAK RECEPTION	1. Poor adjustment of the antenna trimmer (AM only). 2. Beyond normal reception distance from station (FM only). 3. Defective antenna. If FM reception is poor, be sure that the antenna is at 30 to 32 inch height before trying a new antenna.
NO SOUND FROM ONE SPEAKER	1. One speaker defective. 2. Wiring to dead speaker defective. Operate the fader to determine the speaker at fault.

FIG. 5—Radio Trouble Diagnosis Guide

PART 16-5— *Specification*

VENTILATING–HEATING–AIR CONDITIONING–RADIO

Vehicle	Refrigerant 12 Capacity (Pounds)	Current Draw @ 12 Volts				
		Blower Motor (High Speed)		Radio (A.M.)	Magnetic Clutch	Antenna
		Heater	Air Conditioner			
Mercury Intermediate, Falcon, Fairlane	1 5/8	6.5–8.5 Amps	16–20 Amps	0.8 Amp Max.	2 Amps. Max.	—
Mustang and Cougar	1 3/4	5–6.5 Amps	14–18 Amps	0.8 Amp Max.	2 Amps. Max.	—

AIR CONDITIONING COMPRESSOR (ALL VEHICLES)

Torque Limits (Ft-Lbs)		
Description	Tecumseh	York
Cylinder Head	20–24	15–23
Front Seal Plate	6–10	7–13
Service Valve (Rotolock)	25–35	25–35
Mounting Bolt	20–30	20–30
Oil Filler Plug	18–22	4–11
Clutch Mounting	20–30	20–30
Base Plate		14–22
Back Plate		9–17

Compressor Oil Capacities ①	
Tecumseh	7/8 Inch Minimum 1 5/8 Inch Maximum (11 Fluid Ounces)
York	13/16 Inch Minimum 1 3/16 Inch Maximum (10 Fluid Ounces)
Driven Belt Tension (Between Fan Pulley and Air Conditioner Compressor):	
New	140
Used ②	110
Compressor Clutch Run-Out	1/32 Inch Maximum

① Use Suniso #5 or Capella E.
② Belt Operated for a Minimum of 10 Minutes is considered a Used Belt.

Body, Doors And Windows

GROUP 17

PART 17-1—*General Body Service*

Section Page

1 DIAGNOSIS AND TESTING

DUST AND WATER LEAKS

Sealer locations should be considered when checking for dust or water leaks. The forward motion of the car creates a slight vacuum within the body, particularly if a window or ventilator is partially open. Any unsealed small opening in the lower section of the body will permit air to be drawn into the body. If dust is present in the air, it will follow any path taken by the air from the point of entry into the passenger and luggage compartments. Opening the ventilator air ducts will equalize these pressures. Dust accumulates in the rocker panel, and may eventually work its way to the kick-up or the rear body pillar, and follow the contour of the wheelhouse into the luggage compartment.

To eliminate dust leakage, determine the exact point at which the dust enters. The point of entry is often deceptive in that the dust may enter at one point, then follow the passages formed by interior trim to another point.

Under certain conditions, water can enter the body at any point where dust can enter. Any consideration of water leakage must take into account all points covered under dust leaks.

To determine the exact location of a dust leak, it may be necessary to remove the following trim from the car:

1. Cowl trim panel.
2. Quarter trim panel.
3. Rear seat back and seat cushion.
4. Luggage compartment floor mats, spare wheel, and side trim panel.
5. Center pillar trim on 4-door models.
6. Scuff plates.

After removing the trim, the location of most leaks will be readily evident. The entrance of dust is usually indicated by a pointed shaft of dust or silt. Seal these leaks, and road test the car on a dusty road to make sure that all leaks are sealed.

After the road tests, check for indications of a dust pattern around the door openings, cowl panel, lower part of the quarter panel, and in the luggage compartment.

Sometimes leaks can be located by putting bright lights under the car, with the above components removed, and checking the interior of the body joints and weld lines. The light will show through where leaks exist.

2 COMMON ADJUSTMENTS AND REPAIRS

TYPES OF SEALER AND APPLICATION

The all-purpose sealers described below have been selected for service use. The method and points of application are given under each sealer type.

CAULKING CORD AB19560-A

This sealer has a plastic base with an asbestos filler, is heavy bodied, and is commonly known as permagum. It is used on spotweld holes, around moulding clips, or between two surfaces not properly sealed by a gasket. Apply the sealer with a putty knife.

TRIM CEMENT C2AZ-19C525-A

This cement is recommended for instrument panel safety cover and

body panel plastic water shield installation. It is also useful for repair or replacement of other vinyl and rubber trim.

RUBBER CEMENT 8A-19552-B

This quick-drying, strong adhesive material is designed to hold weatherstripping on doors, bodies, deck lids, cowl ventilators, and the surrounding metal. Windows and windshields which are set in rubber can be effectively sealed against leakage by flowing cement into the affected areas.

Clean all grease, dirt, and old sealer from the surfaces to be cemented. For best results, apply a medium coat of cement to both surfaces, allow it to dry until tacky, and press both surfaces firmly together.

SILICON LUBRICANT COAZ-19553-A (JELLY) AND COAZ-19553-C (SPRAY)

This lubricant is to be used on the door window weatherstrips. It is recommended that silicone lubricant be applied to the upper weatherstrips at every regular lubrication period. Its use makes the doors easier to close, avoids weatherstrip squeaks, retards excess weatherstrip wear from chafing between the door glass upper frame and the weatherstrip, and helps to retain door window alignment by reducing friction between the glass frame and rubber weatherstrip.

BODY ALIGNMENT

Servicing the unitized body should present no unusual difficulties or necessitate additional equipment other than that required for the conventional frame and body repair. The application of heat and the use of heavy-duty jacks must be carefully controlled because of the difference in the gauge of the metal in the sub-frame of a unitized body and the stress points developed in a single welded unit construction. It is possible to pull damaged areas back into alignment with the use of lightweight jacks and hydraulic equipment without heating the metal.

Rough out badly damaged areas before taking measurements for squaring up a body. If necessary, remove the glass from the damaged area to prevent damage. In severe cases reinforcement brackets and other inner construction may have to be removed or cut to permit restoration of the outer shell and pillars without excessive strain on the parts. Straighten, install, and secure all such parts in place before attempting to align the body.

In cases of severe or sharp bends, it may be necessary to use heat. Any attempt to cold-straighten a severely bent bracket may cause ruptures of the welds and may also cause cracks in the bent part. Never heat the area more than a dull red.

CHECKING BODY FOR MISALIGNMENT

To align or square up a body, take two opposite diagonal measurements between pillars. Use a measuring tram for these measurements. Take the measurements between reference points such as crease lines or weld joints which are diagonally opposite each other on the two pillars being measured. Since all measurements should be made from the bare metal, remove all interior trim from the checking points.

In some cases, it is difficult to obtain proper body alignment when repairing a body that is damaged on both sides. In these cases, horizontal and vertical measurements can be taken from a body of the same body style. Once these basic dimensions are taken and established on the damaged body, alignment can be made by diagonal measurements taken from points on the two pillars.

Do not attempt to correct any serious misalignment with one jacking operation. This is particularly true if other sections of the body also require aligning. Align each section proportionately until the proper dimensions are obtained.

Door openings are checked in the same manner as the body. Horizontal, vertical, and diagonal checking points are established on all four sides of the door opening that is being measured.

CHECKING UNDERBODY FOR MISALIGNMENT

The dimensions of the underbody must be restored in the repair of major body damage, to provide correct front and rear wheel geometry (Figs. 1, 2 and 3). All the dimensions are detailed to the center line of existing holes in the underbody assembly. Once the frame and suspension members are aligned, the balance of the repair can be performed.

PAINT REFINISHING

PAINT REPAIRS ON GALVANIZED METALS

If for any reason it becomes necessary to perform paint repairs on galvanized rocker panels or any other galvanized steel surfaces, care must be exercised in preparing the bare galvanized surface to properly accept paint, and the best possible paint products must be employed to insure satisfactory adhesion to the metal and to give a good color match with acceptable durability. Most of the approved paint suppliers for refinishing materials agree on the procedure for metal preparation but use different primer recommendations. The methods involving the use of DuPont Preparakote and Ditzler Zinc Dust Primer are indicated here and it is important that either one be employed exactly as directed. No short cuts nor any inter-mixing should be attempted.

METAL PREPARATION FOR GALVANIZED STEEL

1. Strip, sand-off or otherwise remove all paint from the affected galvanized steel panel.
2. Wire-brush or steel-wool the entire metal surface and remove all grease or oil by wiping with a clean solvent.
3. Wipe the panel using a clean cloth or sponge with Lithoform No. 2 (Distributed by the Neilson Chemical Division of Amchem Products, Inc.) or Bonderite No. 34 (Distributed by Parker Rustproof). The work should be kept completely wet for at least three minutes and the metal should be thoroughly etched. If any bright metal remains the treatment should be repeated.
4. Rinse the area with clean water and blow off with compressed air.
5. The dried surface must be primed immediately. Then succeeding coats and color as required must be applied according to vendor's directions. Examples such as the DuPont and Ditzler systems are given as follows:

System for Using DuPont Preparakote

1. Spray Preparakote over properly prepared metal. Force-dry with radiant heat or air-dry overnight. This primer must be dried hard enough to sand wet or dry.
2. Sand the Preparakote very carefully, preferably with No. 400 paper so as to avoid cutting through to bare metal. Blow off and tack clean.
3. Spray two coats of No. 22 clear sealer and allow to air-dry for thirty minutes.
4. Spray on matching Acrylic Lacquer as directed. Then air-dry or force-dry until the lacquer is hard enough to be polished.
5. Polish the lacquer as recommended by supplier.

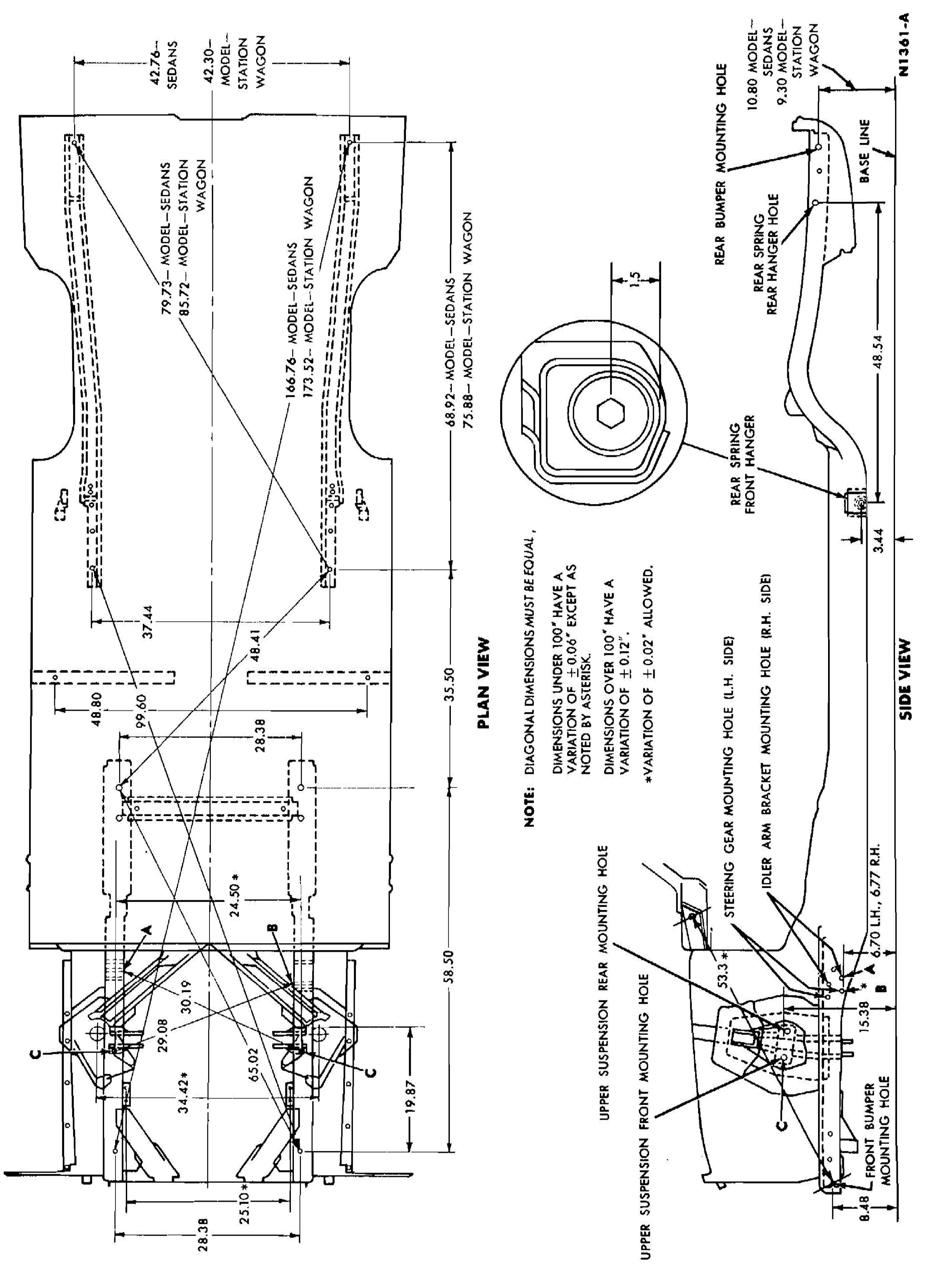


FIG. 1—Mercury Intermediate and Falcon Underbody Dimensions

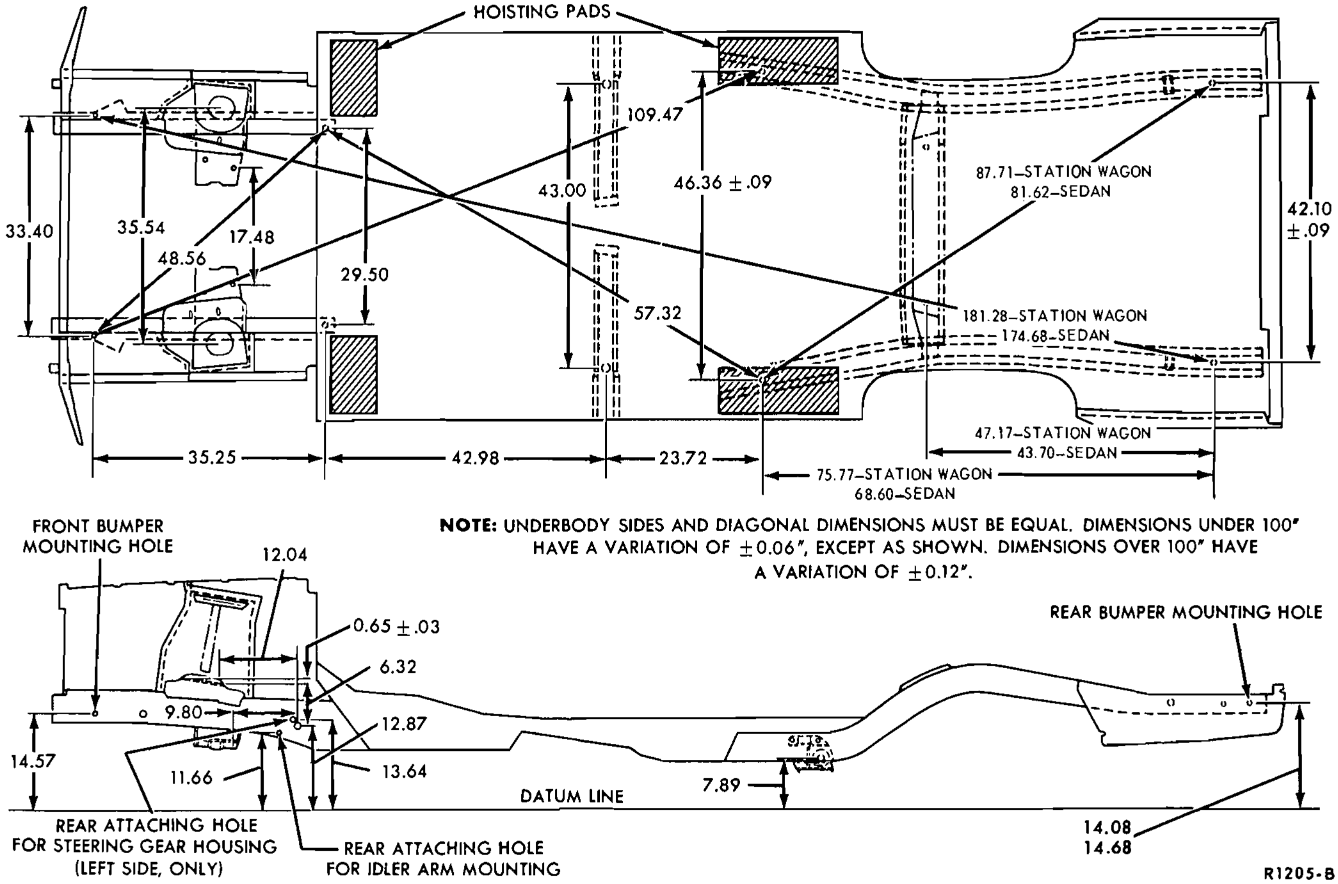


FIG. 2—Fairlane Underbody Dimensions

System For Using Ditzler Zinc Dust Primer

1. Prime the galvanized area with DPE659 Zinc Dust Primer. This is a two-component product and the zinc must be carefully mixed with the vehicle as directed. A recommended film thickness of one mil may be recoated with a lacquer base primer surfacer such as DZL3200 in about twenty minutes. Do not sand DPE659.

2. Spray primer surfacer DZL3200 reduced as directed to a film thickness of about two mils.

3. After drying the primer surfacer about thirty minutes, carefully sand with No. 360 or No. 400 silicon carbide paper, wet or dry, so as not to cut through the zinc dust primer coat. Blow off and tack clean.

4. Spray matching Duracryl lacquers as directed and after drying rub and polish as required.

All material coatings may be force-dried. Careful manipulation is recommended.

ACRYLIC ENAMELS

Acrylic enamels exhibit better better hardness, mar resistance and gloss retention in metallic colors than the ordinary enamels. Acrylic enamels also posess the property of good polishability.

Following are recommended repair procedures for acrylic enamels:

Repair By Polishing

Repair of minor dirt or fallout, sags, mars, scratches, dry spray, overspray, and orange peel can be accomplished by machine or hand polishing or by both sanding and polishing without the necessity of repainting. Repairs of this type should apply to an entire panel while spot repairs should be attempted only in isolated areas.

The suggested polish repair procedure consists of:

1. Remove the defect by oil sanding with 600 grit paper, using water or mineral spirits as a lubricant.

2. Apply a white or light colored medium grit machine polishing compound (Sno-Flake No. 16 or equivalent) to the painted surface with a brush.

3. Polish the entire panel surface using an 1850 rpm wheel and a carpet pad (approximately 5/8-inch nap) or lambswool pad.

4. Buff the surface with a clean lambswool pad.

Normally, acrylic enamels do not need polishing to improve their gloss; however, the foregoing procedure can be used to restore the original luster to the film after weathering, or to improve the surface smoothness of the finish on the entire car.

Repair By Repainting

Acrylic enamels can be repaired by repainting with either conventional air drying or low bake enamels, or with acrylic lacquers. When repainting metallic colors, it is recommended that acrylic lacquer be used since a better color match can be obtained; both the original finish and the repair can be polished to provide the same luster, and the air dry acrylic repair lacquer will provide better durability in service than air dry enamels. **Do not use Nitrocellulose lacquers for exterior repairs.**

When using any one of the three types of repair materials over acrylic enamel, remove all traces of wax, polish or grease with a good silicone remover such as DL-60-3721-A. It is extremely important that a thorough sanding of the original finish be accomplished using No. 400 grit paper. Care should be exercised to insure that all surfaces, including

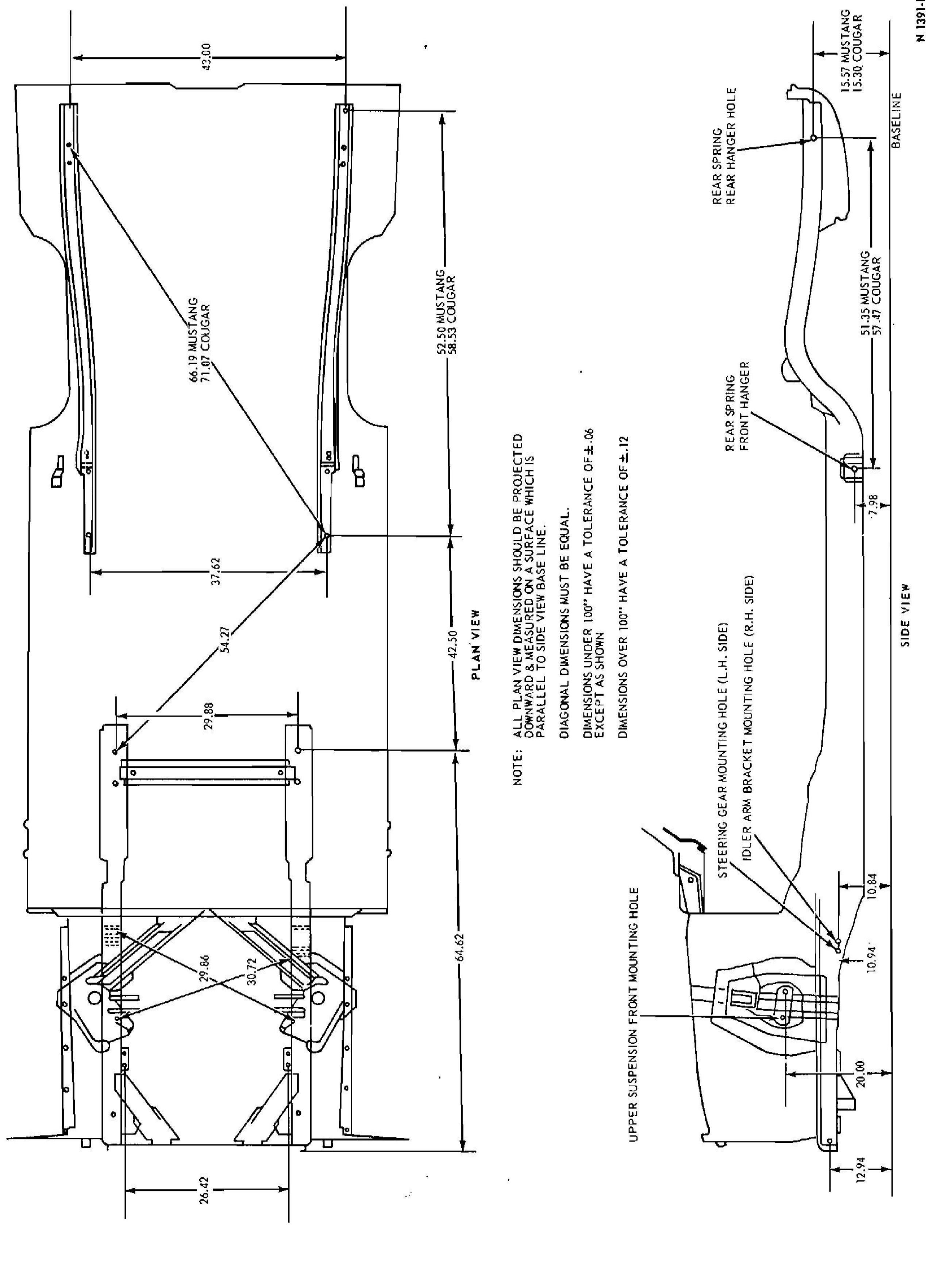


FIG. 3— Mustang and Cougar Underbody Dimensions

edges and areas adjacent to applied mouldings, are thoroughly sanded in order to provide adhesion of the repair top coat. Areas sanded to the base metal (cut through) should be treated with an acid cleaner such as Metalprep (distributed by Amchem Products Inc.). Follow the directions of the supplier as stated on the container.

After sanding, proceed with the application of a primer surfacer reduced according to the supplier's recommendations to any bare metal spots that have been exposed. After the recommended air dry time, sand the primer surfacer with No. 400 grit paper before application of the repair material. The lacquer or enamel used should be reduced as recommended by its supplier.

PAINT DEFECTS AND REPAIR PROCEDURES

Listed here are some of the abnormal paint conditions that may be encountered (Fig. 4). It is very important to identify the paint condition correctly so that the proper repair procedure may be followed. For each of the following paint conditions described, the recommended repair procedure will be indicated.

Blistering

Blistering is the formation of bubbles or pin points on the surface of the finished work. Unless inspected by a magnifying glass, this condition is very hard to identify. In some instances, this complaint may be confused with dirt in the paint. To verify blistering, prick the suspected areas, and note whether a hole exists under the bubble. This condition is caused by rust, moisture, or oil between the coats, metal not properly cleaned, or uneven temperatures between the metal and the paint being sprayed.

Acrylic Enamel. Repair by repainting (color coat). Priming procedure must first be followed if defect is due to poor metal preparation.

Checking

Line checking has the appearance of thin, straight lines criss-crossing each other. These lines may be from one-half inch to four inches or longer, increasing in length as the finish ages.

Acrylic Enamel. Refinish panel. (Color coat—primer if damaged.)

Chipping And Stone Bruises

Chipping occurs when the surface of the finish coat of paint has been broken by a sharp blow, and small particles of paint have flaked off. Freqdently, stone bruises result in chipping.

Acrylic Enamel. Refinish panel. Paint may be spotted if in isolated areas. (Prime the bare metal.)

Cracking

Cracking is evidenced by the paint curling. Frequently, cracking starts at the edge of the panel. This is caused by poor mixing of paint or by temperature changes during the various painting stages.

Acrylic Enamel. Refinish panel. (Prime if both color and primer cracking.)

Crow Footing

Crow footing may be described as small lines branching off from a point in all directions and giving the appearance of a crow's foot. Crow footing is usually caused by spraying a second coat before the first coat is dry, by spraying an excessively thick coat, or by thinners which evaporate too fast.

Acrylic Enamel. Refinish panel. (Color coat.)

Dirt In Paint

Patches where dirt appears are sometimes confused with blistering. To verify the condition, prick the suspected areas, and note whether there is foreign material under the surface.

Acrylic Enamel. Refinish panel. Procedure will be effective in most cases. (Color coat.)

Mildew

Mildew growth which occurs along radial lines is most commonly found in a very dark gray or black color.

Acrylic Enamel. Repair by polishing.

Off-Color

The term off-color is applied to adjacent areas on which the colors do not match. It may also appear when making spot repairs.

Acrylic Enamel. Refinish panel if polishing does not correct condition. (Color coat.)

Orange Peel

Orange peel is a term used to describe an uneven, mottled appearance on the paint surface. This is usually caused by improper thinning of the paint.

Acrylic Enamel. Refinish panel if polishing does not correct condition. (Color coat.)

Overspray

Overspray is evidenced by a rough, dull finish in the area surrounding the paint repair.

Peeling

Peeling occurs when large areas of the finish or primer coat separate from the metal or prime coat. This is usually caused by wax, grease, rust or oil under the paint. Do not confuse with orange peel.

Pits And Pop-Ups

Pits and craters may be identified by the appearance of small round depressions in the paint. These may be caused by not allowing the first coat to dry sufficiently before applying the second coat or from failure to remove silicone polishes before repainting.

Acrylic Enamel. First use polish repair procedure refinish panel if necessary. (Color coat.)

Thin Paint

The primer will show through the finish coat as a result of an excessively thin color coat, or application of the color coat before the surface is dry.

Acrylic Enamel. Refinish panel. (Color coat.)

Runs And Sags

The uneven collections of paint on the finish surface are referred to as runs and sags. The collections may appear in the form of tear drops or sagging lines. Usually these lines are quite soft and sometimes they may be wrinkled. This is usually caused by over-application of paint or hesitation in the stroke of the gun.

Acrylic Enamel. Use polish repair procedure.

Scratches

Scratches are thin marks or tears that may partially or completely penetrate the surface of the finish coat of paint.

Acrylic Enamel. Use polish repair procedure for shallow penetration. Refinish panels to correct conditions of deep penetration.

Spot Discoloration

This is evidenced by brown spots or stains on the surface. Stains or spots can be caused by road tar, acid or alkali-bearing water from the streets.

Acrylic Enamel. Use polish repair procedure.

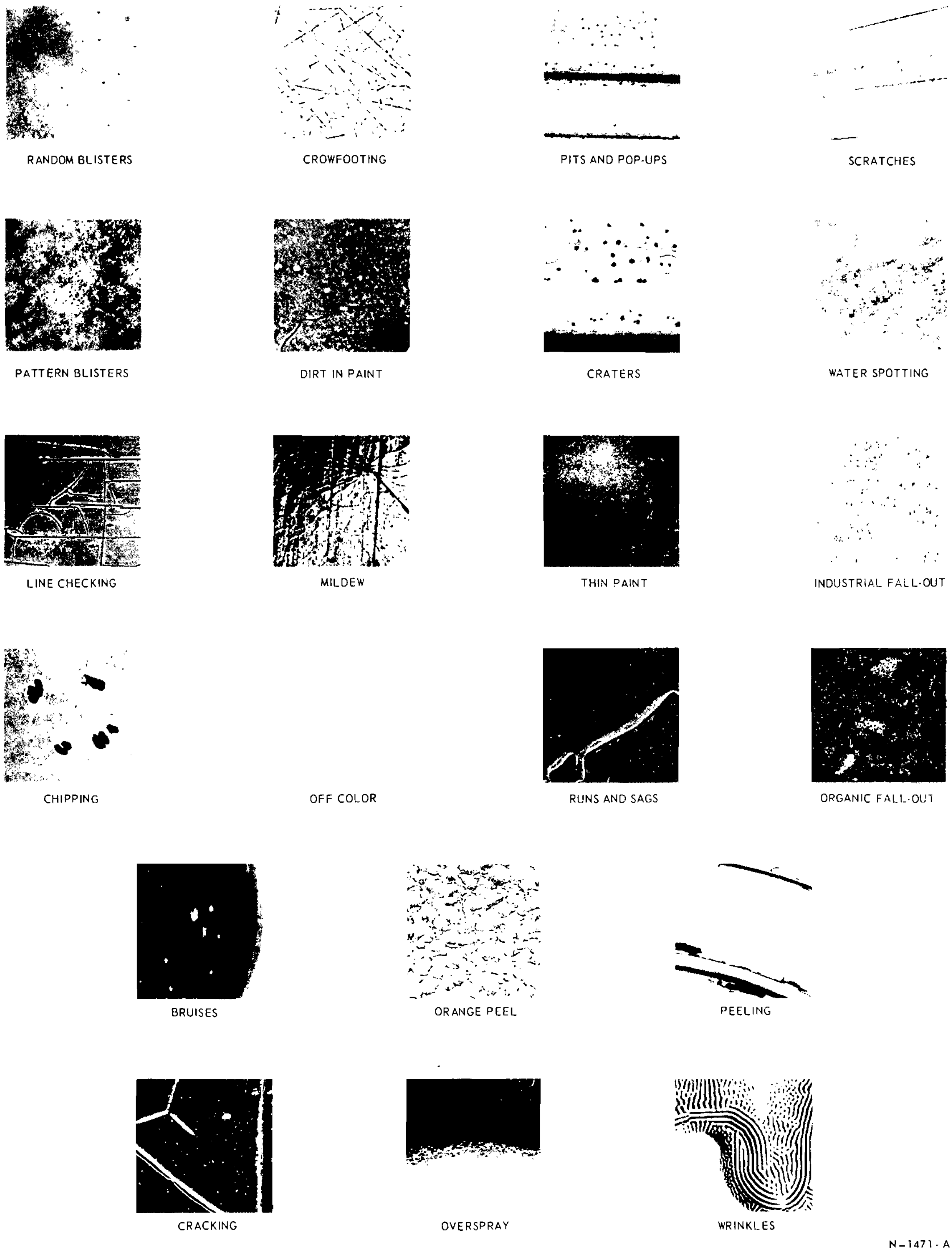


FIG. 4—Paint Defects

Water Spotting

Water spotting is evidenced by a milky pattern where water drops have fallen.

Acrylic Enamel. Use polish repair procedure.

Industrial Fall-Out

Industrial fall-out is the result of particles being exhausted into the air by the various processes of heavy industry, or in areas where there is a concentration of industry.

Industrial fall-out particles appear to the eye as tiny rust-colored dots on the paint film and the surface will feel rough to the touch. Some of the particles have excellent adhesion and are difficult to remove. However, the following procedure has proven effective in the removal of this fall-out.

1. Wash the car with car wash compound (COAA-19B521-A) to remove loose soil. Rinse well and examine the painted surfaces for iron base fall-out particles. If there is a significant quantity of fall-out not removed by ordinary washing, the oxalic treatment should then be used. All cracks, ledges, grooves, etc., where fall-out has accumulated should be cleaned by wiping or by air blow-off.

2. Dissolve six to eight ounces of oxalic acid (dry) in one gallon of warm water and add one or two tablespoonsful of a non-alkaline detergent such as car wash compound (COAA-19B521-A). This acid detergent solution must be prepared and kept in a clean NON-METALLIC container.

Apply this solution liberally to all affected surfaces of the car with a large sponge. Use a broad wiping stroke and keep the work completely wet for about 15 minutes, or until the operator can no longer feel any surface roughness or isolated gritty particles with bare or gloved finger tip. If this is not done thoroughly, rust staining may soon redevelop. Be sure that the entire acid cleaning procedure is performed in a sheltered area so that the work will be kept as cool as possible to prevent rapid evaporation of water and consequent surface drying. Do not work in the sun.

3. Rinse with clear water. This must be done very thoroughly to prevent possible corrosion.

No traces of acid should be left on any surface. Bright trim parts, particularily anodized aluminum and stainless steel, may be stained by prolonged contact with the cleaning solution. Painted areas also can be spotted by prolonged exposure. It is also important to keep the oxalic acid cleaner solution from leaking to the inside of the car because some fabrics might be bleached or discolored by the solution.

If the fall-out is not completely removed or is deeply imbedded in the paint film, cleaning with the acid detergent mixture must be repeated. This may be aided by using a fine scrub brush, possibly a nylon bristle type. Make sure that the light scrubbing required does not scratch the paint. It is sometimes helpful to briskly rub the work with a mixture of equal parts of oxalic acid cleaner and FoMoCo cleaner wax polish (8A-19519-A) using a piece of heavy towelling. Again, a thorough water rinsing is extremely important.

Sometimes small black spots remain after the oxalic cleaning has removed all iron based fall-out. Such deposits might be asphaltic or they might be over-spray. These usually can be removed by rubbing vigorously with a cloth saturated with a mixture of kerosene and Actusol (about five parts of kerosene to one part of Actusol). Any residue of this solvent mixture may be readily flushed off with water.

Organic Fall-Out

Organic fall-out may result from parking cars under trees or from the air under certain atmospheric conditions.

Acrylic Enamel. Refinish damaged panels. (Color coat and primer.)

Interior Paint Repairs

The proper matching of colors can be obtained if the following procedures are carefully adhered to:

1. Clean the surface to be painted with wax and silicone remover.

2. Feather-edge the damaged area with 400 grit wet or dry sandpaper. (Prime all areas of bare metal with M-6J-12S Primer.)

3. Mix the paint per instructions on the can and spray several light coats.

Allow the paint to become tacky between coats.

4. Spray the entire area sparingly with B7A-645-S Lacquer Leveler which will blend the repaired area with existing painted surfaces.

3 CLEANING AND INSPECTION

FLOOR PAN PLUGS AND GROMMETS

The floor-pan plugs seal the various access holes. If any plugs are missing or improperly installed, a dust or water leak may result. This also applies to the grommets used on the dash panel. When dust or water leaks are evident, these plugs and grommets should be checked for proper installation.

DRAIN HOLES

Drain holes or valves located on the underside of each rocker panel, quarter panel, and door should be cleared periodically.

BODY MAINTENANCE

Regular body maintenance preserves the car's appearance and reduces the cost of maintenance during the life of the car. The following steps are suggested as a guide for regular body maintenance:

1. Vacuum the interior thoroughly and wash the car.

2. Check all openings for water leaks, and seal where necessary.

3. Cement all loose weatherstrips which are still usable.

4. Replace all door and deck lid weatherstrips which are unfit for service.

5. Apply silicone lubricant to the weatherstripping.

6. Replace all cracked, fogged, or chipped glass.

7. Align the hood, doors, and deck lid if necessary.

8. Inspect the windshield wiper blades and replace them if necessary.

9. Tighten the sill plate and garnish moulding screws.

10. Clean the seats, door trim panels, and headlining.

11. Touch up or paint chipped or scratched areas.

12. Drain holes located on the underside of each rocker panel, quarter panel, and door, should be cleared periodically.

RATTLE ELIMINATION

Most rattles are caused by a loose bolt or screw. Foreign objects such as nuts, bolts, or small pieces of body deadener in the door wells, pillars and quarter panels are often the source of rattles. Door wells can be checked by carefully striking the underside of the door with a rubber mallet. The impact made by the mallet will indicate if loose objects are in the door well.

In the event that tightening the bolts and screws, located on such assemblies as the doors, hood, and deck lid does not eliminate the rattles, the trouble is probably caused by misalignment. If this is the case, follow the adjustment and alignment procedures for these assemblies.

Rattles and squeaks are sometimes caused by weatherstripping and anti-squeak material that has slipped out of position. Apply additional cement or other adhesive, and install the material in the proper location to eliminate this difficulty.

EXTERIOR CLEANING

The outside finish should be frequently washed. Never wipe the painted surface with a dry cloth. Dusting the finish when it is dry tends to rub the dust and dirt into the baked enamel, and leaves a sandpaper effect on the surface. To keep the finish bright and attractive and eliminate the necessity of using polish, wash the car whenever it has accumulated a moderate amount of dirt and road salt.

The bright metal parts of the car require no special care. Periodic cleaning will preserve the beauty and life of these finishes. Wash with clear water or if the parts are very dirty use FoMoCo COAA-19B521-A compound. Using a clean soft cloth or a sponge and water, rinse and wipe the parts dry. FoMoCo Chrome Cleaner may be used sparingly to remove rust or salt corrosion from chrome plated parts. Do not scour aluminum or chrome finished parts with steel wool or polish them with products containing abrasives. A FoMoCo Polish will provide excellent protection for all bright metal parts.

INTERIOR CLEANING

Use a vacuum cleaner to remove dust and dirt from the upholstery or floor covering. Vinyl and woven plastic trim that is dusty can usually be cleaned with a damp cloth. **Do not use cleaning materials containing kerosene, naptha, toluol, xylol 10°, lacquer thinners, cellulose acetate, butyl cellosolve, carbon tetrachloride, body polish, battery acid, anti-freeze, gasoline, motor oils or other type lubricants.**

Approved cleaners B8A-19523-A, or -B, B5A-19525-A, COAZ-19526-A or -B (soft trim cleaners), BAF-19521-A (leather and vinyl upholstery cleaner), and C1AZ-19C507-A (convertible back window cleaner) are available for service. Instructions for the use of these cleaners are indicated with their containers.

CARE OF WOOD GRAIN PANELING

Washing

Never wipe the panels or trim rails with a dry cloth. This method of cleaning tends to rub dust particles into the finished surface and leave fine scratches. Flush off all loose dirt and other elements, and wipe the body panels and rails with a sponge and plenty of cold water. If desired, a mild soap may be used. Rinse thoroughly with clear water and wipe dry.

GLASS FIBER TRIM RAIL REMOVAL AND INSTALLATION

The glass fiber trim rails are serviced with the wood-grain already applied. To remove the body side trim rails, remove the cap over each trim rail screw to gain access to the screws. Remove the screws and the trim rail assembly.

When installing the body side trim rail, apply sealer (AB-19560-A) around each mounting hole. Install the cap retainer, screw and cap.

APPLICATION OF WOOD-GRAIN TRANSFERS

Wood grain transfers are available for application to the panels. The materials necessary to apply the transfers are a bonding coat (M-4584), 20% transfer solution of M-5412-A, and clear spar varnish.

If the surface on which the transfer is to be applied is damaged, repair and metal finish first.

1. Mask off the area where the transfer is to be applied.

2. Prime-coat all bare metal areas, and wet-sand.

3. Spray the surface with transfer bonding coat (M-4584). This coat is the binder for the transfer adhesive.

4. Allow the binding coat to air-dry for one hour, or heat-dry (160° F) for 20 minutes.

5. Lightly wet-sand the binding coat, and wipe it dry.

6. Make a paper template of the damaged area, and cut the new transfer to size, using the template as a guide. Leave about 1/2 inch of extra material around the edge of the transfer to allow for matching and trimming.

7. Mix a solution of 20% transfer solution M-5412-A and 80% water. This solution permits shifting of the transfer after it has been applied, so that the graining can be matched. **Try a sample of the transfer and solution on an old piece of metal or fender. If the transfer cannot be pulled off after two minutes, the solution is too strong and must be diluted with more water.**

8. Soak the transfer in lukewarm water for one minute to loosen the paper backing. **Do not remove the backing until the transfer is applied.**

9. Using a cheese cloth pad, apply a 20% M-5412-A transfer solution to the panel. **Any excess solution that runs down on adjacent panels must be wiped off immediately.**

10. Place the wet transfer on the panel, paper side out. Adjust the transfer to match the graining on adjoining panels, and carefully remove the paper backing.

11. Sponge the transfer with clean water to remove all traces of the paper backing adhesive.

12. Remove all air bubbles and wrinkles with a squeegee.

13. Wash the transfer with clear water and dry with a chamois.

14. Pierce any blisters or small air bubbles as they appear, and press down the area with a finger to remove the air and excess solution.

15. Allow the panel to air-dry for one hour, or heat dry (160° F) for 20 minutes.

16. When the panel is dry, spray two coats of clear spar varnish over the transfer. **Do not use clear lacquer or shellac.**

4 VEHICLE HOISTING

The unitized body-frame construction requires special precautions and procedures when the car is jacked up or hoisted. In some cases, special hoist adapters must be used as recommended by specific hoist manufacturers.

Refer to the Owner's Manuals when using the jack supplied with the car.

DRIVE-ON TYPE HOIST

To prevent possible damages to the underbody, do not drive the car onto the drive-on type hoist without first checking for possible interference between the upright flanges of the hoist rails and the underbody. Should there be interference, the hoist flanges should be modified as necessary and/or the approach ramps built up to provide the needed clearance.

RAIL TYPE—FREE WHEELING HOIST

FRONT

The front adapters or hoist plates must be carefully positioned in contact with the lower suspension arms to assure safe, accurate lifting.

REAR

The hoist adapters must be positioned carefully under the rear axle to prevent damage to the shock absorbers when the car is raised. The hoist rails should be raised slowly and the position of the adapters checked.

FORK LIFT—TWIN POST HOIST

FRONT

To assure safe hoisting, the front post adapters must be positioned carefully to contact the center of the lower suspension arms (Figs. 5 and 6).

REAR

To prevent damage to the shock absorbers, the rear forks must contact the axle at points not farther out board than one inch from the circumference welds near the differential housing. Carefully raise the rear post and check the position of the fork (Figs. 5 and 6).

FRAME CONTACT HOIST

Frame contact hoist adapters are necessary to lift the car. The hoist adapter pads should each cover at least 12 square inches of underbody area. Figs. 5 and 6 show recommended contact points for the hoist pads.

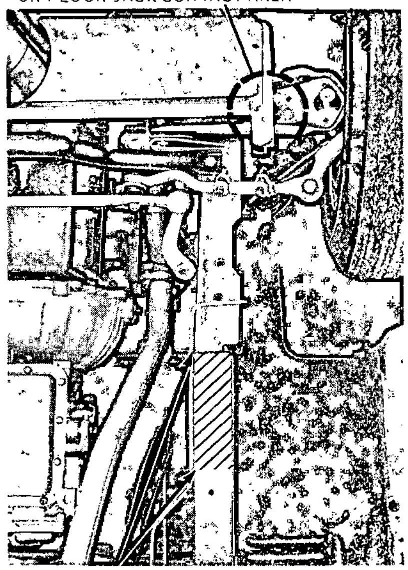


FIG. 5—Front Hoist Contact Areas

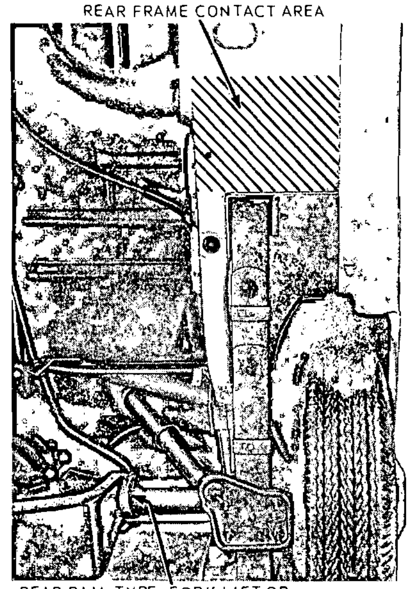


FIG. 6—Rear Hoist Contact Areas

FLOOR JACK

When a stationary floor jack or a roll jack is to be used, there are several specific recommended points of contact. Either side of the car may be raised at the front by jack contact at the lower arm strut connection. Either side of the front end of the car may also be raised by jack pressure on the front crossmember, or on the crossmember to which the stabilizer is connected. **Do not attempt to use jack pressure on either front or rear Mustang and Cougar bumpers.**

PART 17-2—Front Sheet Metal, Bumpers, Exterior Mouldings

1 IN-VEHICLE ADJUSTMENTS AND REPAIRS

HOOD ADJUSTMENTS

The hood is provided with fore and aft, vertical, and side-to-side adjustments (Fig. 1). These directions refer to the position of the hood when it is fully lowered. The elongated bolt slots in the hinge at the hood provide the side-to-side adjustment. The enlarged holes in the hinge at the fender apron provide both vertical and fore and aft adjustments.

Hood bumpers, located on the top left and the top right surface of the radiator support, can be adjusted up and down to provide a level surface alignment of the hood panel with the front fenders.

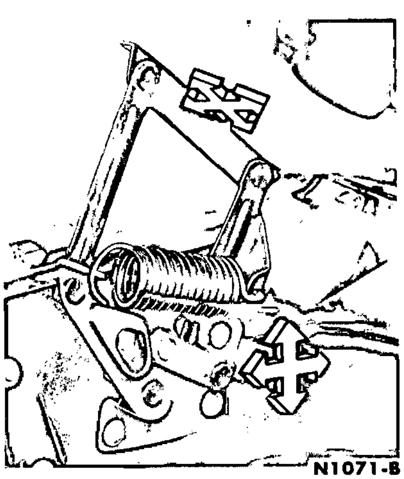


FIG. 1— Hood Hinge Installation —Typical

HOOD LATCH ADJUSTMENT — COUGAR

Before adjusting the hood latch mechanism, make certain that the hood is properly aligned. The hood latch (Fig. 2) can be moved fore or aft and side to side to align it with the latch dowel. The auxiliary catch can be adjusted to engage the hood latch catch.

1. Loosen the hood latch attaching bolts. Move the latch assembly as required to align it with the latch dowel on the hood.

2. Tighten the attaching bolts.

3. Loosen the lock nut on the hood latch dowel and turn the dowel inward to adjust the hood tighter, or outward to loosen the adjustment. **Do not bend the hood latch dowel.**

4. The latch dowel is adjusted correctly when the top of the hood is flush with the fenders, when latched.

5. Tighten the dowel lock nut after adjusting the latch dowel.

6. To adjust the auxiliary catch striker, loosen the two attaching screws and position the catch correctly. Tighten the screws and lower the hood to make certain the auxiliary catch striker engages the hood latch auxiliary catch.

7. Open and close the hood several times to be certain that the latch mechanism is secure.

HOOD LATCH ADJUSTMENT—MERCURY INTERMEDIATE, FAIRLANE, AND MUSTANG

1. With the hood open loosen the hood latch retaining screws (Fig. 3).

2. Move the hood latch mechanism as required to align it with the latch striker.

3. Tighten the latch retaining screws. Open and close the hood sev-

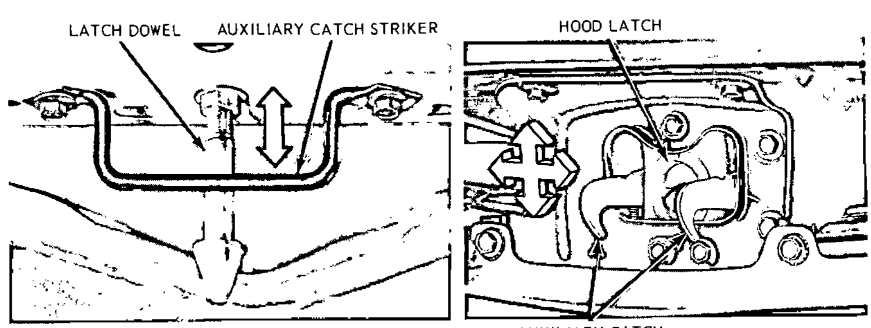


FIG. 2— Hood Latch Mechanism—Cougar

eral times to be sure that it latches securely.

HOOD LATCH ADJUSTMENT—FALCON

Before adjusting the hood latch, make certain that the hood is properly aligned. The hood latch can be adjusted up and down and from side to side to align it with the hood latch hook attached to the hood.

1. Loosen the two hood latch attaching screws. Move the latch up or down and from side to side as required for proper alignment with the hood latch hook.
2. Tighten the hood latch attaching bolts and check the operation and alignment of the latch. Be sure that the hood is securely latched after adjustment.

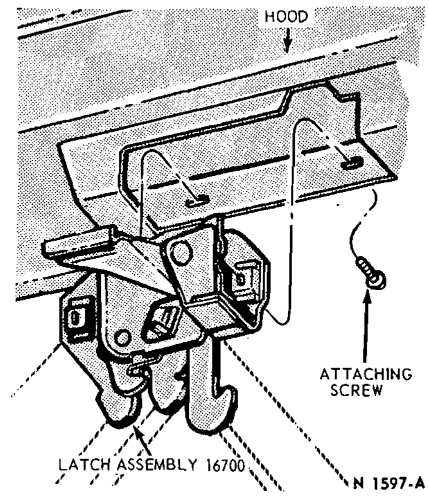


FIG. 3—Typical Hood Latch—Mercury Intermediate, Fairlane, and Mustang

2 REMOVAL AND INSTALLATION

HOOD HINGE

1. Prop the front of the hood in the open position and cover the fender and cowl panel.
2. Remove the hinge-to-hood retaining bolts, the retaining bolts at the fender apron and cowl (Fig. 1), and remove the hinge.
3. Position the hood hinge to the body and install the hinge retaining bolts.
4. Adjust the hood for a proper fit.

HOOD LATCH — MERCURY INTERMEDIATE, FAIRLANE, AND MUSTANG

1. Open the hood and remove the two latch attaching screws and remove the latch assembly.
2. Position the latch assembly to the hood and install the two attaching screws.
3. Adjust the latch assembly as outlined in Section 1.

HOOD LATCH — COUGAR

1. Open the hood and remove six bolts attaching the hood latch support to the support braces. Then, remove the hood latch and support from the vehicle.
2. Remove two bolts attaching the latch to the support and separate the latch from the support.
3. Position the latch to the support and install the two attaching bolts.
4. Position the support to the support braces and install the six attaching screws.
5. Adjust the hood latch and dowel.

RADIATOR GRILLE—MERCURY INTERMEDIATE

1. Remove two grille to headlight housing attaching screws from each end of the grille (Fig. 4).
2. Remove one screw attaching the lower center of the grille to the hood lock support.
3. Remove two screws attaching the upper center of the grille to the hood latch support and remove the grille from the vehicle.
4. Remove three screws attaching the center ornament to the grille and

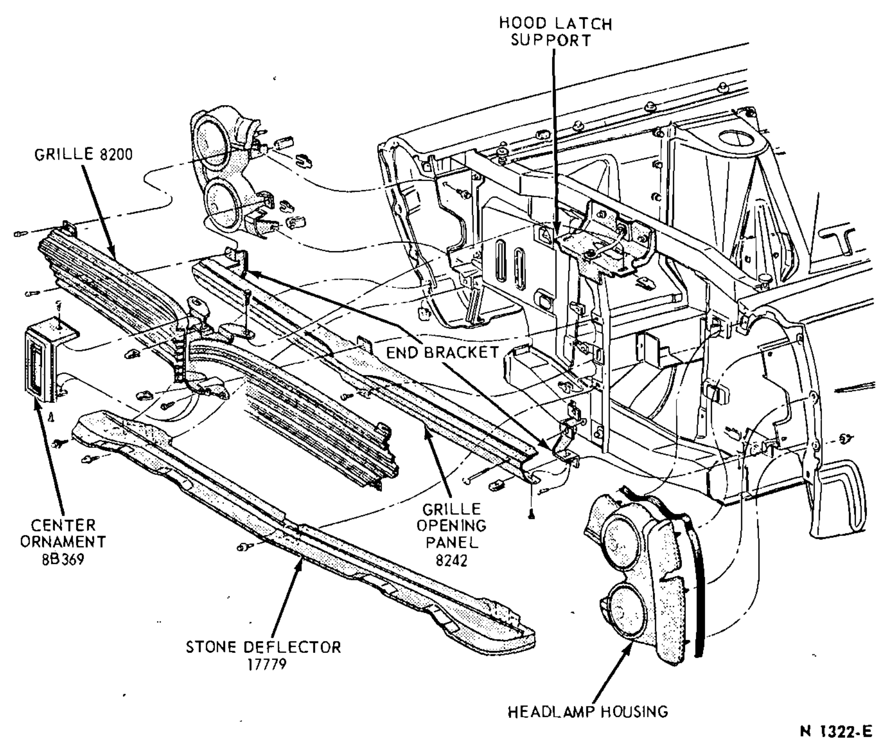


FIG. 4—Mercury Intermediate Grille Assembly Installation

remove the ornament from the grille.

5. Position the center ornament to the grille and install the three attaching screws.

6. Position the grille to the vehicle and install the seven attaching screws.

RADIATOR GRILLE—FALCON

REMOVAL

1. Remove the headlight door retaining screws and remove the headlight doors.
2. Remove one screw from each end of the grille at the headlight housing.
3. Remove one screw attaching the lower edge of the grille to the radiator support on each side of the radiator.
4. Remove one screw attaching the grille to each grille support and remove the grille.

INSTALLATION

1. Position the grille to the vehicle and install one screw at each end of the grille to attach it to the headlight housings (Fig. 5).
2. Install the two grille to grille support attaching screws.
3. Install the two screws attaching the grille lower edge to the radiator support.
4. Install the headlight doors.

RADIATOR GRILLE—FAIRLANE

REMOVAL

1. Remove the headlight door retaining screws and remove the headlight doors.
2. Remove three screws attaching the grille to the hood latch support. Remove four attaching screws from each end of the grille (Fig. 6).
3. Remove the grille assembly from the car.
4. Remove the four nuts retaining the grille ornament and remove the ornament.
5. Remove the screws retaining the upper and lower grille mouldings to the grille assembly and remove the grille mouldings and grille moulding retainers.

INSTALLATION

1. Install the upper and lower grille moulding retainers on the grille mouldings, position the grille mouldings on the grille and install the grille moulding retaining screws.
2. Position the grille ornament on the grille and install the ornament retainer and retaining nuts.
3. Position the grille assembly on the car and install the grille assembly retaining screws.
4. Install the headlight doors.

RADIATOR GRILLE—MUSTANG

REMOVAL

1. Open the hood and remove five grille center bar retaining nuts. Then, remove the grille center bars and medallion from the grille.
2. Remove the hood bumper from each side of the hood opening at the grille.
3. Remove two screws attaching each end of the grille to the grille panel (Fig. 7).
4. Remove two screws attaching the grille to the hood latch hook support.
5. Remove seven screws attaching the grille to the stone deflector and grille panel and remove the grille from the vehicle.

INSTALLATION

1. Position the grille to the stone deflector and grille panel and install the seven grille to stone deflector attaching screws.
2. Install two screws attaching each end of the grille to the grille panel.
3. Install the hood bumper on each side of the hood opening at the grille (Fig. 7).
4. Install two screws attaching

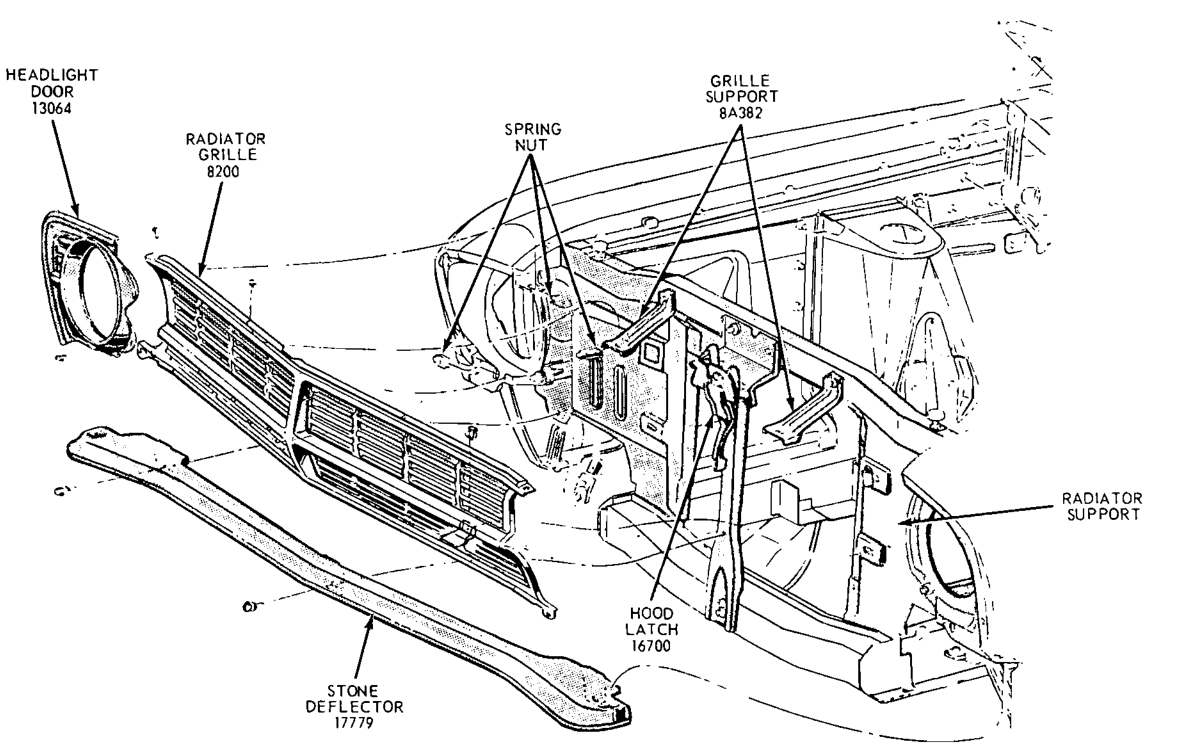


FIG. 5—Falcon Grille Installation

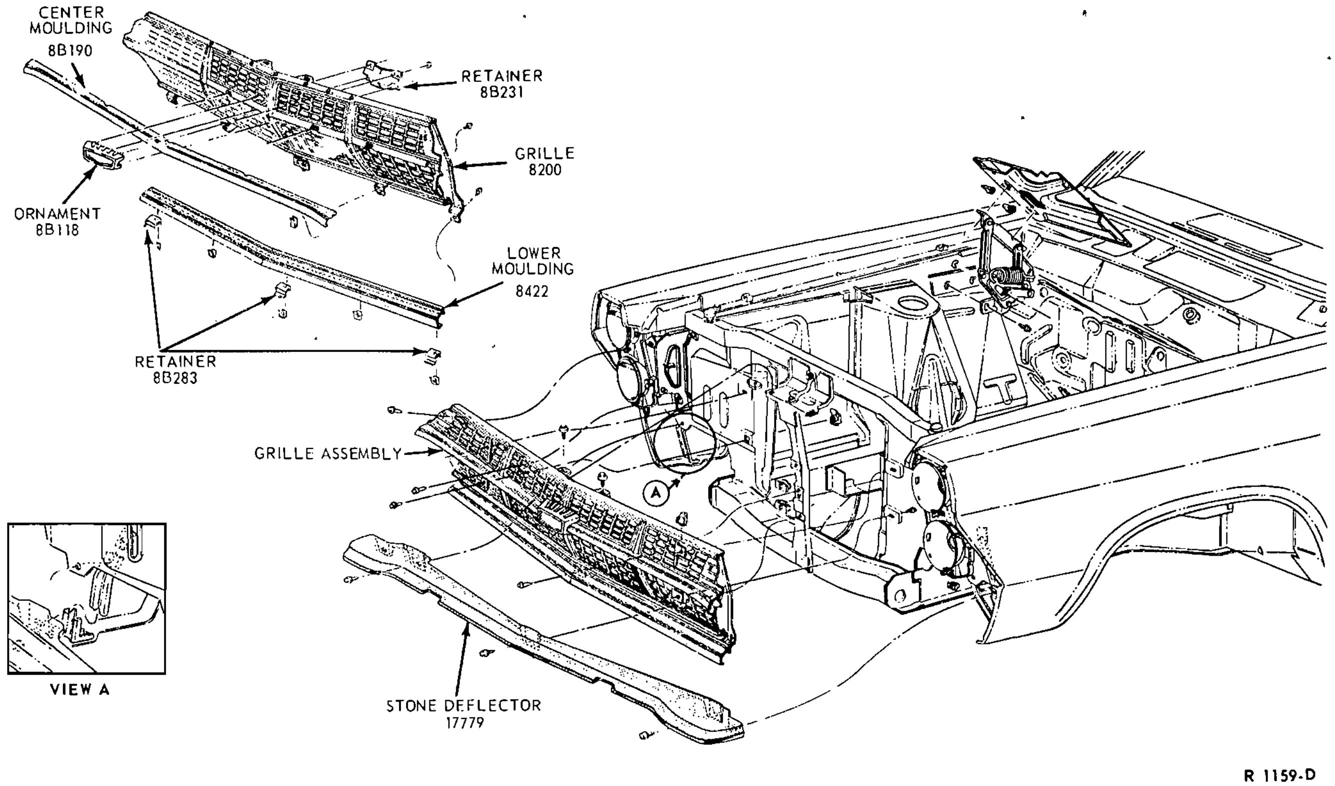


FIG. 6—Fairlane Grille and Hood Lock Assembly

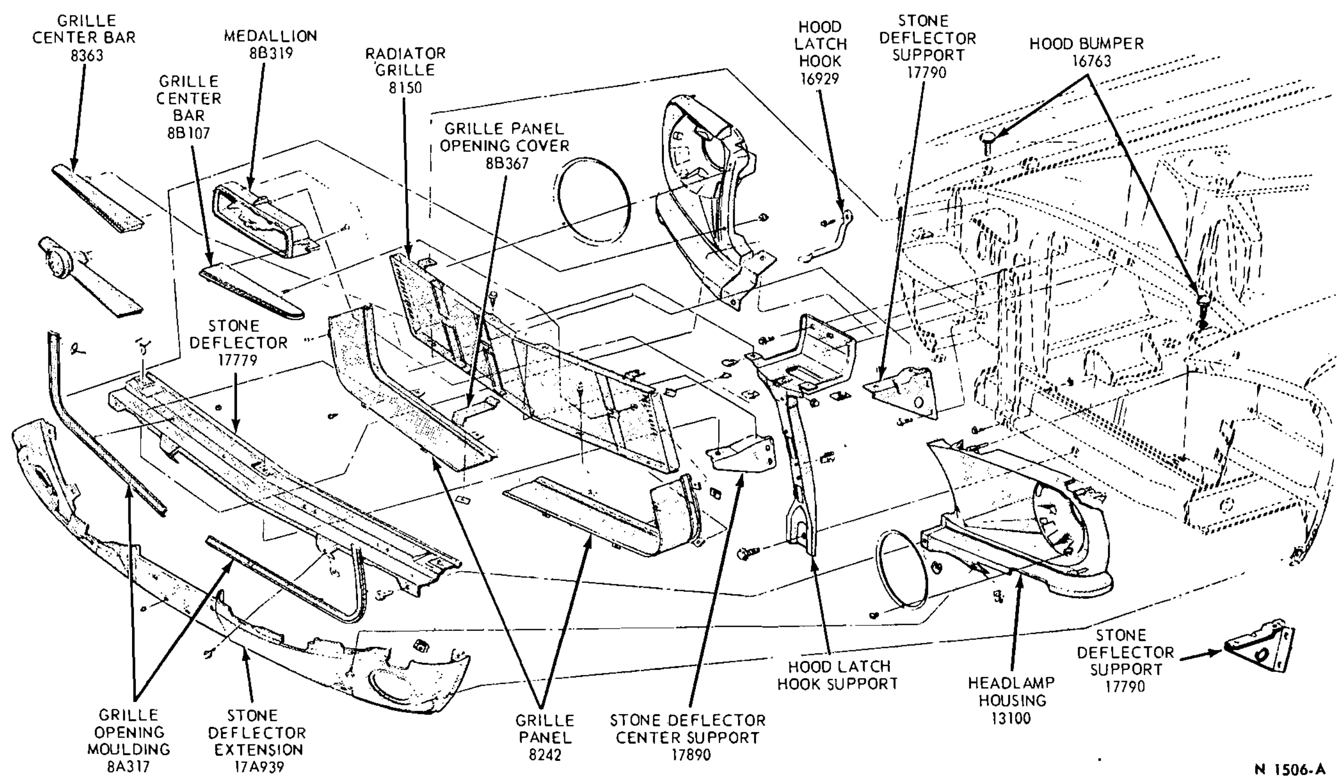


FIG. 7—Mustang Grille and Related Parts

the grille to the hood latch hook support.

5. Position the grille center bars and medallion to the grille and install the five retaining nuts.

RADIATOR GRILLE— RIGHT SIDE — COUGAR

REMOVAL

1. Open the hood and remove four screws attaching the center panel to the hood latch support brace (Fig. 8).

2. Disconnect the battery cables and remove the battery from the vehicle.

3. Disconnect the vacuum hoses from the headlight cover vacuum actuator.

4. Disconnect the headlight and parking light wires at the wire connector.

5. Raise the vehicle as required and remove the right parking light from the front bumper for clearance.

6. Remove two stone deflector to hinge support attaching screws (Fig. 8).

7. Lower the vehicle and remove two screws attaching the right radiator grille to the hood latch support brace (Fig. 8).

8. Remove four screws attaching the hinge support and grille assembly to the radiator support. Then, remove the hinge support and right grille assembly from the vehicle.

INSTALLATION

1. Position the hinge support and grille assembly to the vehicle and loosely install the four screws attaching the assembly to the radiator support (Fig. 8).

2. Install two screws attaching the radiator grille to the hood latch support brace. Do not tighten the screws at this time.

3. Raise the vehicle and install the two stone deflector to hinge support attaching screws (Fig. 8). Tighten the screws and install the parking light in the bumper. Then, lower the vehicle.

4. Tighten the remaining six grille and hinge support attaching screws.

5. Connect the headlight and parking light wires at the connector and insert the wires in the wire retaining clip.

6. Connect the vacuum hoses to the headlight cover vacuum actuator.

7. Position the center panel to the hood latch support brace and install the four attaching screws.

8. Install the battery in the vehicle and connect the battery cables.

9. Start the engine and check the operation and adjustment of the headlight covers. Refer to Group 15.

RADIATOR GRILLE— LEFT SIDE — COUGAR

REMOVAL

1. Open the hood and remove four screws attaching the center panel to the hood latch support brace (Fig. 8).

2. Disconnect the vacuum hoses from the headlight cover vacuum actuator and remove the two vacuum hose clips.

3. Disconnect the headlight and parking light wires at the wire connector.

4. Raise the vehicle as required and remove the left parking light from the front bumper for clearance.

5. Disconnect the vacuum hoses from the vacuum tank and remove the vacuum tank from under the left front fender.

6. Remove two hinge support to radiator support attaching screws from under the left front fender.

7. Remove two stone deflector to hinge support attaching screws (Fig. 8).

8. Lower the vehicle and remove two screws attaching the left radiator

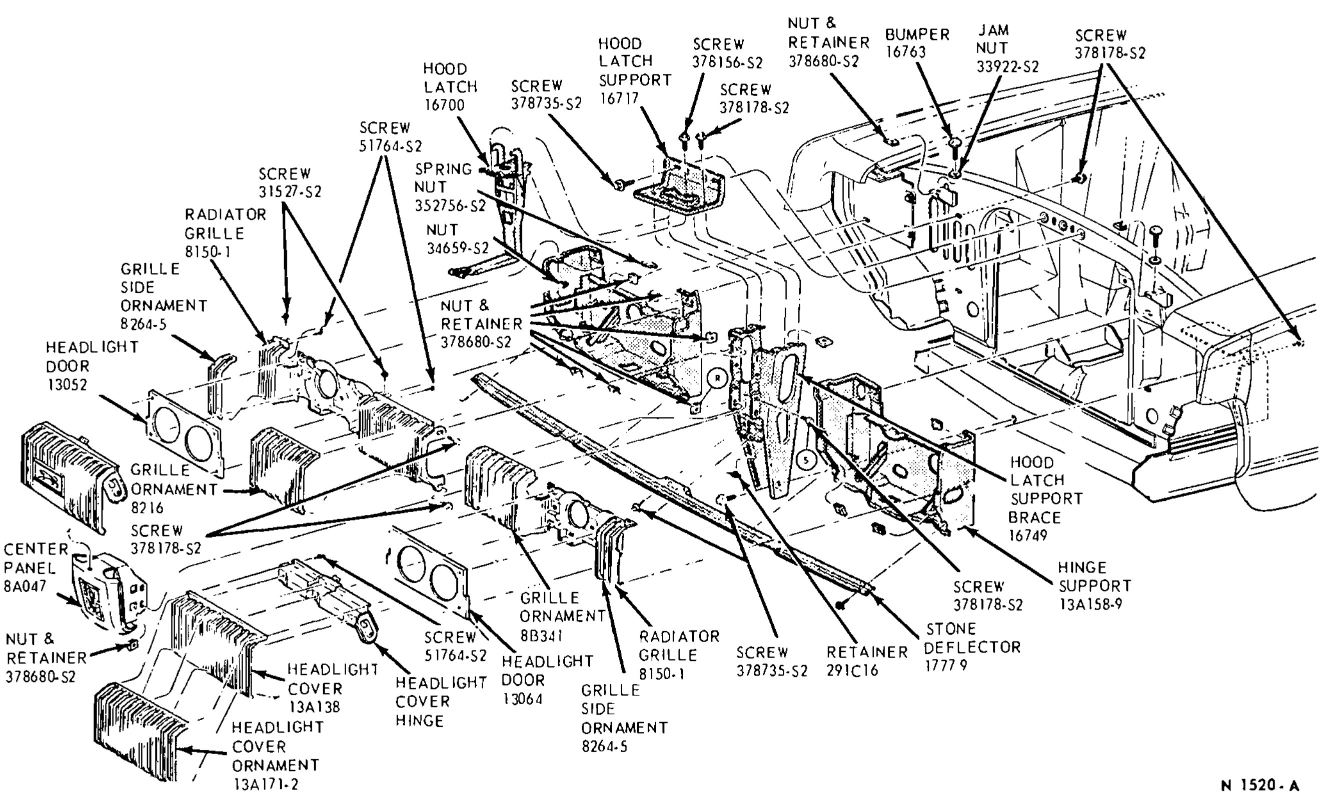


FIG. 8— Cougar Grille-Disassembled

grille assembly to the hood latch support brace (Fig. 8).

9. Remove two hinge support to stone deflector attaching screws located under the hood and remove the hinge support and left grille assembly from the vehicle (Fig. 8).

INSTALLATION

1. Position the hinge support and grille assembly to the vehicle and loosely install the two hinge support to radiator support attaching screws located under the hood.
2. Install two screws attaching the radiator grille to the hood latch support brace. Do not tighten the screws at this time.
3. Raise the vehicle as required and install the two stone deflector to hinge support attaching screws and the two radiator support to hinge support attaching screws. Tighten the screws and install the parking light in the bumper.
4. Install the vacuum tank and lower the vehicle.
5. Tighten the remaining four grille and hinge support attaching screws.
6. Connect the headlight and parking light wires at the connector and insert the wires in the wire retaining clip.
7. Route the vacuum hoses and connect them to the vacuum actuator and vacuum tank. Then, install the hose retaining clips.
8. Position the center panel to the hood latch support brace and install the four attaching screws.
9. Start the engine and check the operation and adjustment of the headlight covers. Refer to Group 15.

FRONT BUMPER—MERCURY INTERMEDIATE, FALCON, AND FAIRLANE

REMOVAL

1. Disconnect the parking light wiring connectors and push the wires through their routing holes in the fender aprons.
2. Remove the right and left end bracket to fender attaching bolts, if so equipped (Figs. 9, 10 and 11).
3. Remove the bumper left and right inner and outer arm-to-frame side rail retaining bolts and remove the bumper assembly. (Figs. 9, 10, and 11).
4. Remove the bumper inner and outer arms from the bumper.
5. Remove the license plate.
6. Remove the parking light assembly retaining nuts and remove the parking light assemblies.

INSTALLATION

1. Install the license plate on the new bumper.
2. Install the parking light assemblies in the new bumper.
3. Install the bumper inner and outer arms on the new bumper using spacers and washers as shown in Figs. 9, 10 and 11. Then, install the end brackets on the bumper, if so equipped.
4. Position the bumper assembly to the car and loosely install the bumper arm-to-frame side rail retaining bolts.
5. Install the end bracket to fender attaching screws, if so equipped.
6. Align the bumper assembly and tighten the bumper arm-to-frame side rail retaining bolts.
7. Route the parking light wiring through the fender aprons and connect the wiring connectors.

FRONT BUMPER—MUSTANG

REMOVAL

1. Raise the car to provide working access.
2. Tape the stone deflector to prevent scratching the paint finish.
3. Remove the left and right end bracket bolts from the fenders.

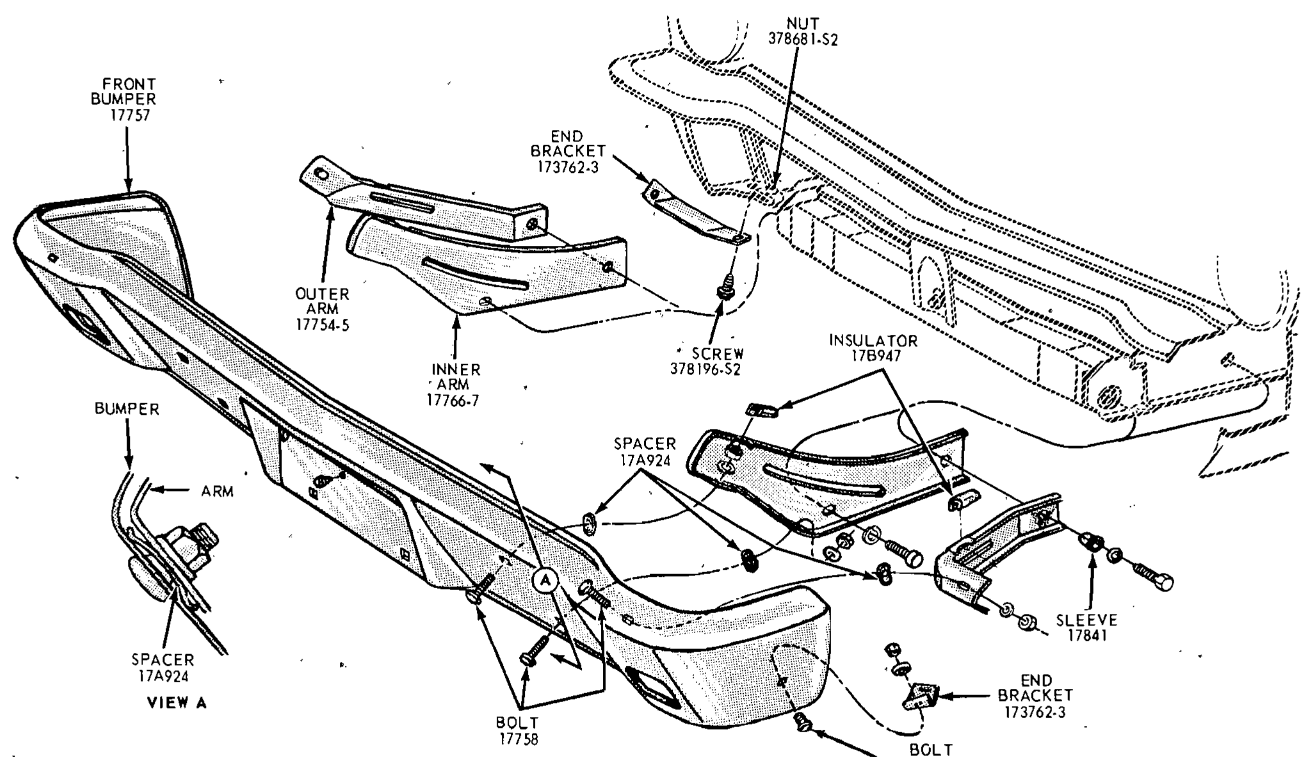


FIG. 9—Mercury Intermediate Front Bumper Installation

4. Remove the bumper bar-to-inner arm and the bumper bar-to-outer arm retaining bolts from each side of the bumper (Fig. 12). Remove the bumper and end brackets as an assembly.

INSTALLATION

1. Transfer the end brackets to the new bumper.
2. Position the bumper on the car. Install the bumper bar-to-inner arm and the bumper bar-to-outer arm retaining bolts.
3. Install the end bracket retaining bolts.
4. Remove the protective tape from the stone deflector and lower the car.

FRONT BUMPER GUARD—MUSTANG

1. Remove the screw and washer retaining the bumper guard to the frame lower side rail (Fig. 12).
2. Remove the screw and washer retaining the bumper-guard to the inner arm (Fig. 12) and remove the guard assembly.
3. Transfer the nut and retainer assembly and the rubber spacer to the new bumper guard (Fig. 12, View B).
4. Position the bumper guard assembly to the bumper.
5. Install the two retaining screws.

FRONT BUMPER—COUGAR

REMOVAL

1. Raise the vehicle and remove two screws retaining each bumper guard to the bumper arm and frame and remove the bumper guards.
2. Disconnect the parking light wires and remove the valance panel below the bumper (Fig. 13).
3. Remove the screw attaching each bumper arm to fender brace at the bumper arm.
4. Remove two bolts attaching each bumper arm to the frame rails and remove the bumper from the vehicle.
5. Remove the outer and inner arms from the bumper.

INSTALLATION

1. Transfer the rubber pad from each end of the bumper to the new bumper if bumper replacement is necessary.
2. Install the inner and outer arms on the bumper.

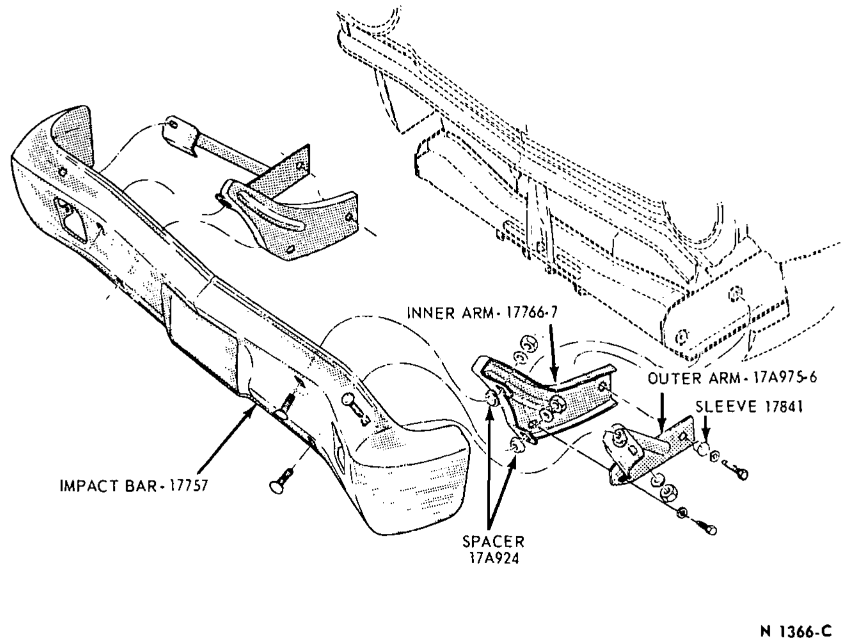


FIG. 10—Falcon Front Bumper Installation

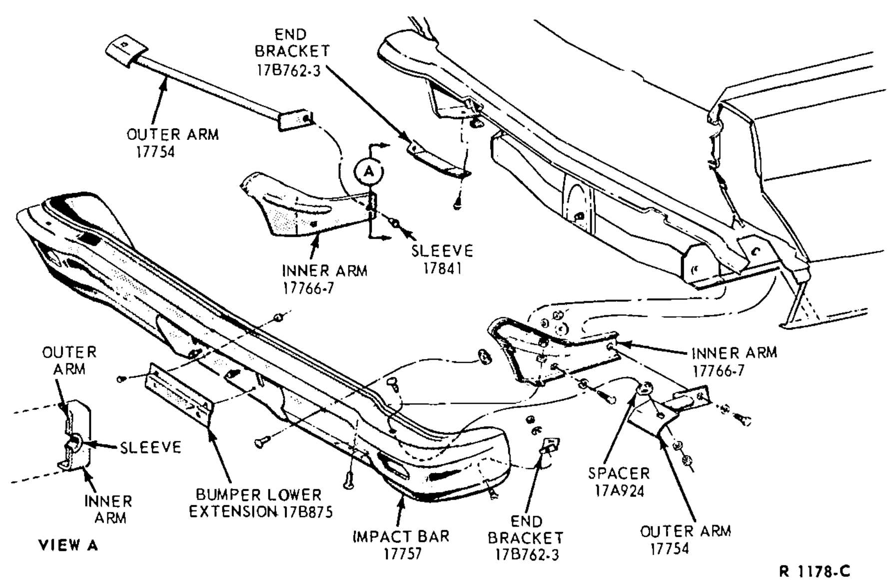


FIG. 11—Fairlane Front Bumper Installation

3. Position the bumper to the vehicle and install the inner and outer arm to frame rail attaching bolts.
4. Install the screws attaching the fender brace to the bumper arm.
5. Adjust the bumper for proper vehicle appearance and tighten all attaching bolts and nuts.
6. Install the valance panel below the bumper and connect the parking light wires.
7. Install the bumper guards.

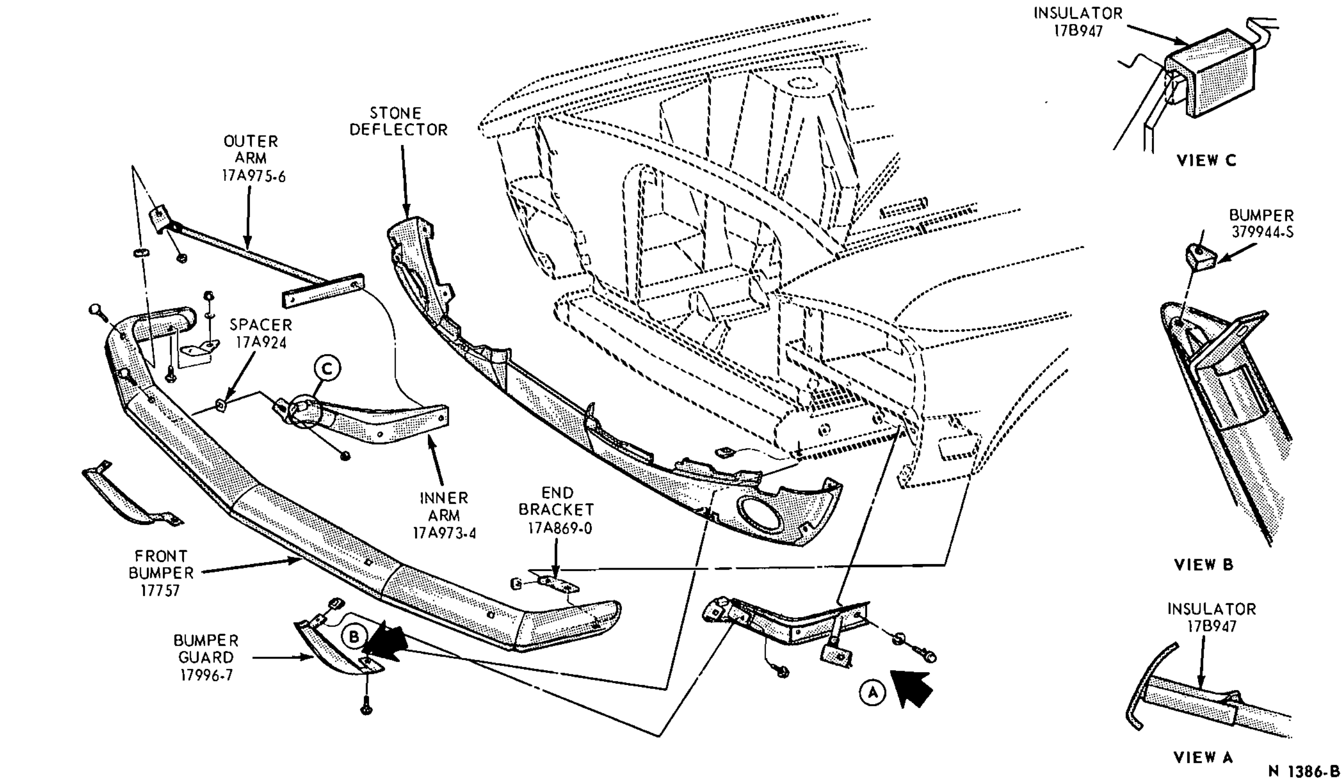


FIG. 12—Mustang Front Bumper Installation

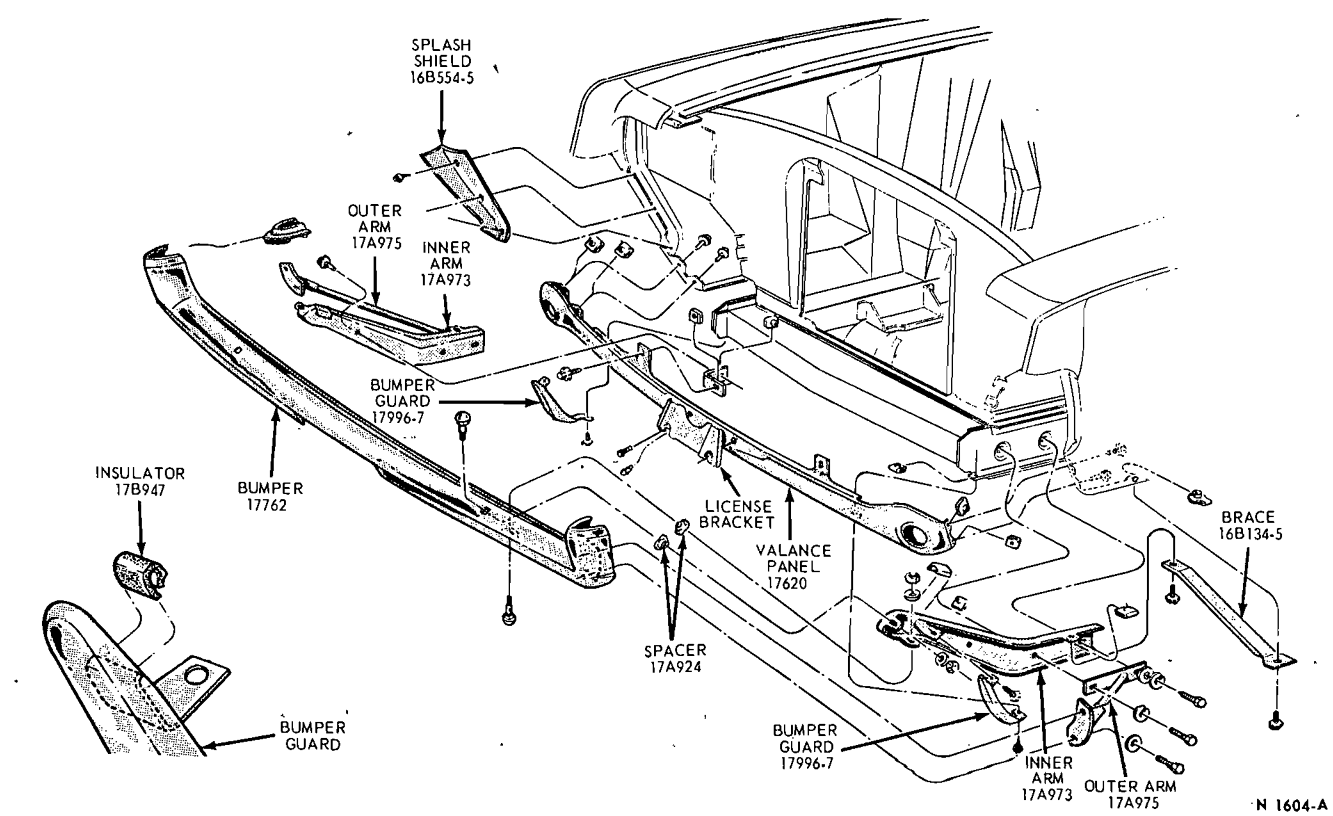


FIG. 13—Cougar Front Bumper

REAR BUMPER—FALCON EXCEPT MODEL 71

REMOVAL

1. Remove the screws retaining the license plate lamp assembly to the rear bumper.
2. Remove the rear license plate.
3. Remove the four bumper arm-to-frame retaining bolts (Fig. 14), and remove the bumper assembly.

INSTALLATION

1. Transfer the rear bumper arms, bumper lower extension and rubber bumper to the new bumper.
2. Position the bumper assembly on the car and install the bumper arm-to-frame retaining bolts.
3. Position the license plate lamp assembly to the bumper and install the retaining bolts.
4. Install the license plate.

REAR BUMPER—MERCURY INTERMEDIATE AND FAIRLANE EXCEPT MODEL 71

REMOVAL

1. Open the luggage compartment. Disconnect the license light wiring connector and push the license light wire out of its routing grommet.
2. Remove the spare tire and wheel assembly.
3. From beneath the car, remove the access covers from the lower bumper arm-to-body lower panel retaining screw and washer assemblies.
4. Remove the bumper arm-to-body lower panel retaining screw and washer assemblies (Fig. 15).
5. From inside the luggage compartment, remove the upper inner arm-to-lower back panel retaining screw and washer assemblies (Fig. 15). Remove the bumper assembly from the car and place it on a bench.
6. FAIRLANE ONLY: Remove the screw and washer assemblies retaining the license plate support bracket to the impact bar (Fig. 15), and remove the license plate support bracket assembly from the impact bar.
7. Remove the rubber license support bracket-to-impact bar bumpers (Fig. 15).
8. Remove the bumper outer and inner arm-to-impact bar retaining bolts and spacers (Fig. 15). Remove the outer and inner arms from the impact bar.

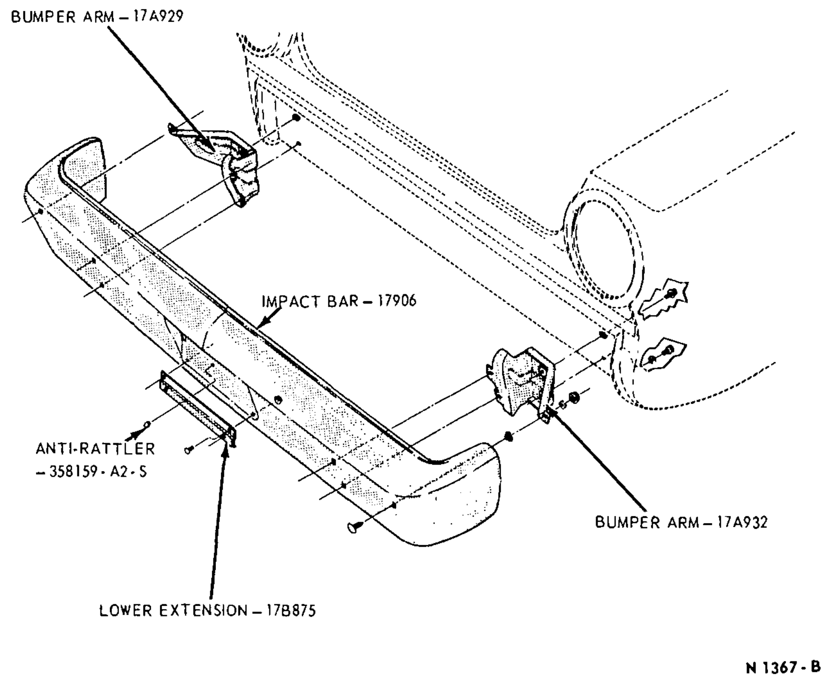


FIG. 14—Falcon Rear Bumper Installation

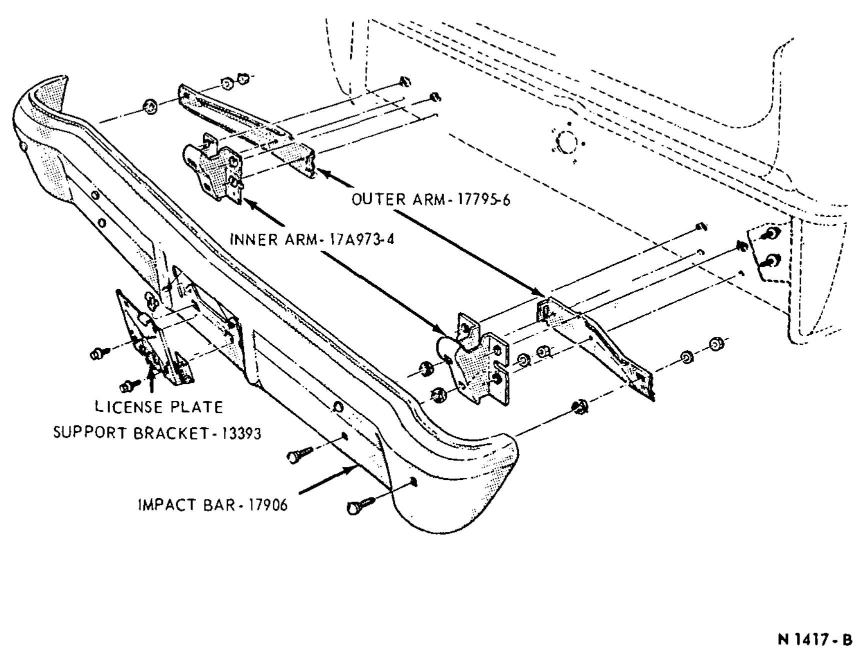


FIG. 15—Mercury Intermediate and Fairlane Rear Bumper Installation

INSTALLATION

1. Insert the bumper inner and outer arm-to-impact bar retaining bolts in the impact bar. Install the spacers and the inner and outer arms on the impact bar. Torque the retaining nuts to 17 to 23 ft-lbs.

2. Install the license plate support rubber bumpers on the impact bar.

3. FAIRLANE ONLY: Install the license plate support on the impact bar.

4. Position the bumper assembly on the car. Feed the license plate light wire through its routing grommet in the lower back panel and start one upper arm-to-body retaining screw on each side.

5. Shift the bumper assembly as necessary for proper alignment and install the remaining bumper arm-to-body retaining screws. Torque the retaining screws to 25 to 38 ft-lbs specification.

6. Install the lower bumper arm-to-lower back panel retaining screw access covers.

7. Install the spare tire and wheel assembly. Connect the license plate light wiring connector.

REAR BUMPER—MUSTANG

REMOVAL

1. Open the luggage compartment. Remove the spare wheel and disconnect the license light wiring connector.
2. Remove the four bumper mounting bracket-to-body retaining bolts and remove the bumper assembly (Fig. 16).
3. Remove the four bumper-to-mounting bracket retaining bolts and remove the brackets (Fig. 16).
4. Remove the two license plate light and bracket retaining screws and remove the light and bracket.

INSTALLATION

1. Position the license plate light and bracket on the bumper and install the two retaining screws.
2. Position the bumper mounting brackets on the bumper and install the bumper-to-mounting bracket retaining bolts.
3. Position the bumper assembly to the vehicle. Start one bumper bracket to body attaching bolt on each side. Then, adjust the bumper for proper alignment and install the remaining bumper bracket attaching bolts.
4. Connect the license light wiring and install the spare wheel.

REAR BUMPER GUARD—MUSTANG

REMOVAL

1. Open the luggage compartment door and remove the spare tire assembly to provide access to the bumper guard upper retaining screw and washer.
2. From inside the luggage compartment, remove the guard upper retaining screw (Fig. 16).
3. From beneath the car, remove the guard lower retaining screw (Fig. 16). Remove the bumper guard.

INSTALLATION

1. Transfer the two nuts and retainers to the new bumper guard.
2. Position the bumper guard on the car and install the two retaining screws.
3. Install the spare tire assembly.

REAR BUMPER—COUGAR

REMOVAL

1. Open the luggage compartment

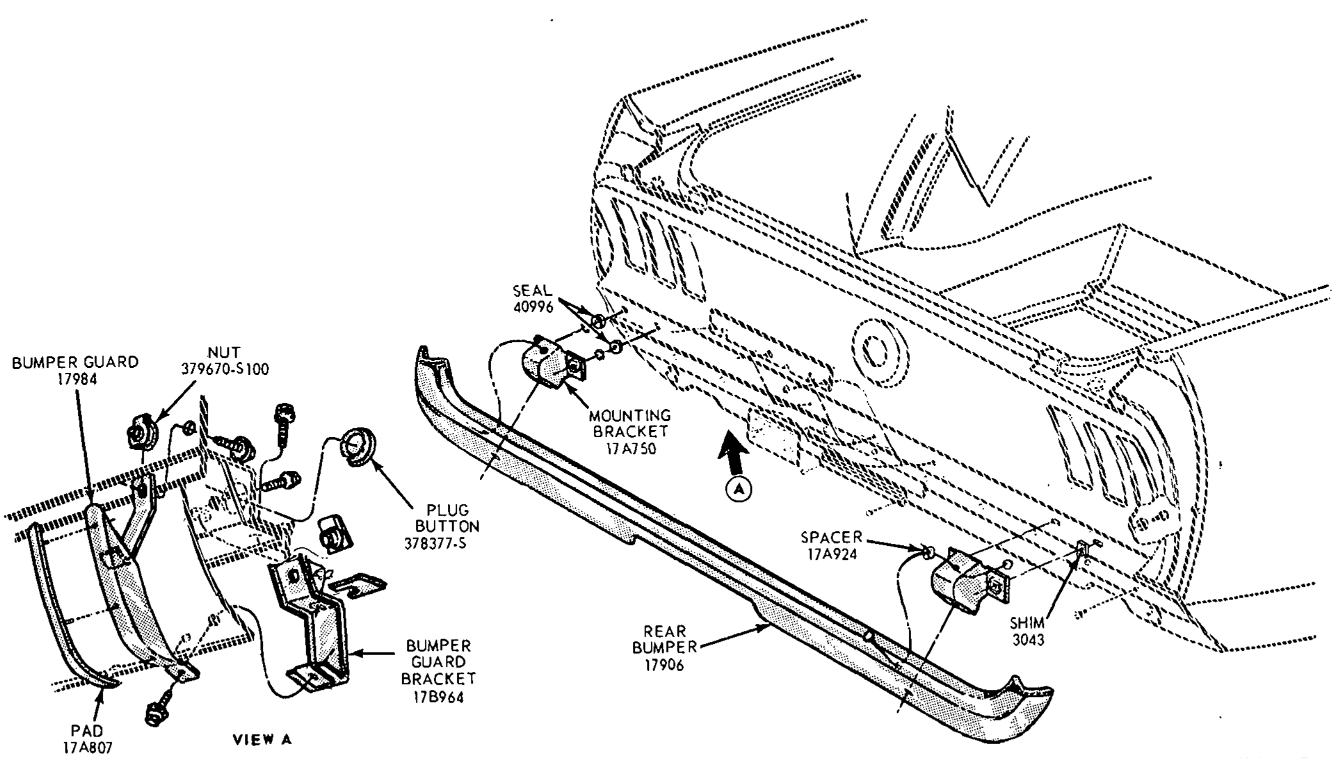


FIG. 16—Mustang Rear Bumper Installation

door and remove the rear lining boards from the back panel.

2. Remove four bolts attaching the bumper and mounting brackets to the back panel and remove the bumper (Fig. 17).

3. Remove two bolts and nuts attaching each mounting bracket to the bumper and remove the brackets from the bumper.

4. Remove the anti-squeak pads from each end of the bumper.

INSTALLATION

1. Install the anti-squeak pads on the bumper.

2. Position the mounting brackets to the bumper and install the attaching bolts and nuts (Fig. 17).

3. Position the bumper and mounting brackets to the back panel and install the attaching bolts and lock washers. Adjust the bumper and tighten the attaching bolts.

4. Position the rear lining boards to the back panel and install the attaching screws.

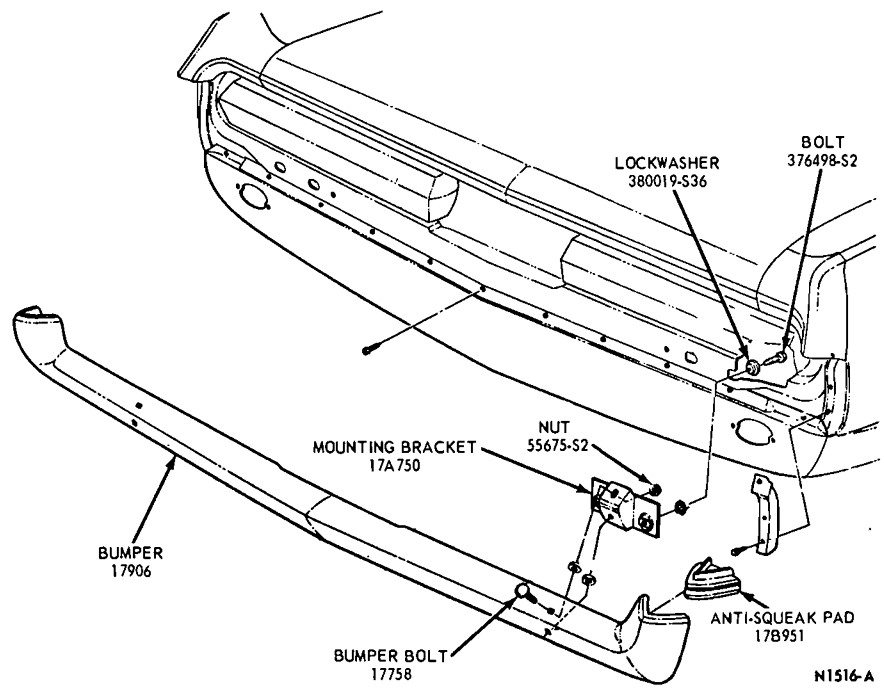


FIG. 17—Cougar Rear Bumper Installation

REAR BUMPER—MODEL 71

REMOVAL

1. Disconnect the license plate lights at the connectors and remove the lights from the bumper.

2. Remove the license plate from the bumper.

3. Remove four nuts and bolts attaching the bumper arms to the frame rails and remove the bumper.

4. Remove the outer arms from the bumper.

5. Falcon Only: Remove four bolts and nuts and remove the inner arms from the bumper.

6. Fairlane and Mercury Intermediate Only: Remove two reinforcement attaching bolts and nuts and four inner arm attaching bolts and nuts to remove the reinforcement and inner arms from the bumper.

7. Transfer the license plate retainers and rubber bumper to the new bumper.

INSTALLATION

1. Fairlane and Mercury Intermediate Only: Position the reinforcement and inner arms to the bumper with spacers inserted between the arms and bumper. Then, install the attaching bolts and nuts.

2. Falcon Only: Position the inner arms to the bumper. Insert spacers between the inner arms and install the four attaching bolts and nuts.

3. Position the outer arms to the bumper with a spacer between them and install the attaching bolt and nut.

4. Position the bumper to the vehicle and loosely install the four attaching bolts and nuts. Align the bumper and tighten the bolts and nuts.

5. Install the license plate.

6. Install the license plate lights and connect the wires at the connector.

EXTERIOR MOULDINGS

Before removing the exterior mouldings, it should be determined by the type of retainer used whether a respective door, quarter or luggage compartment trim panel must first be removed to provide access (Figs. 18 through 41).

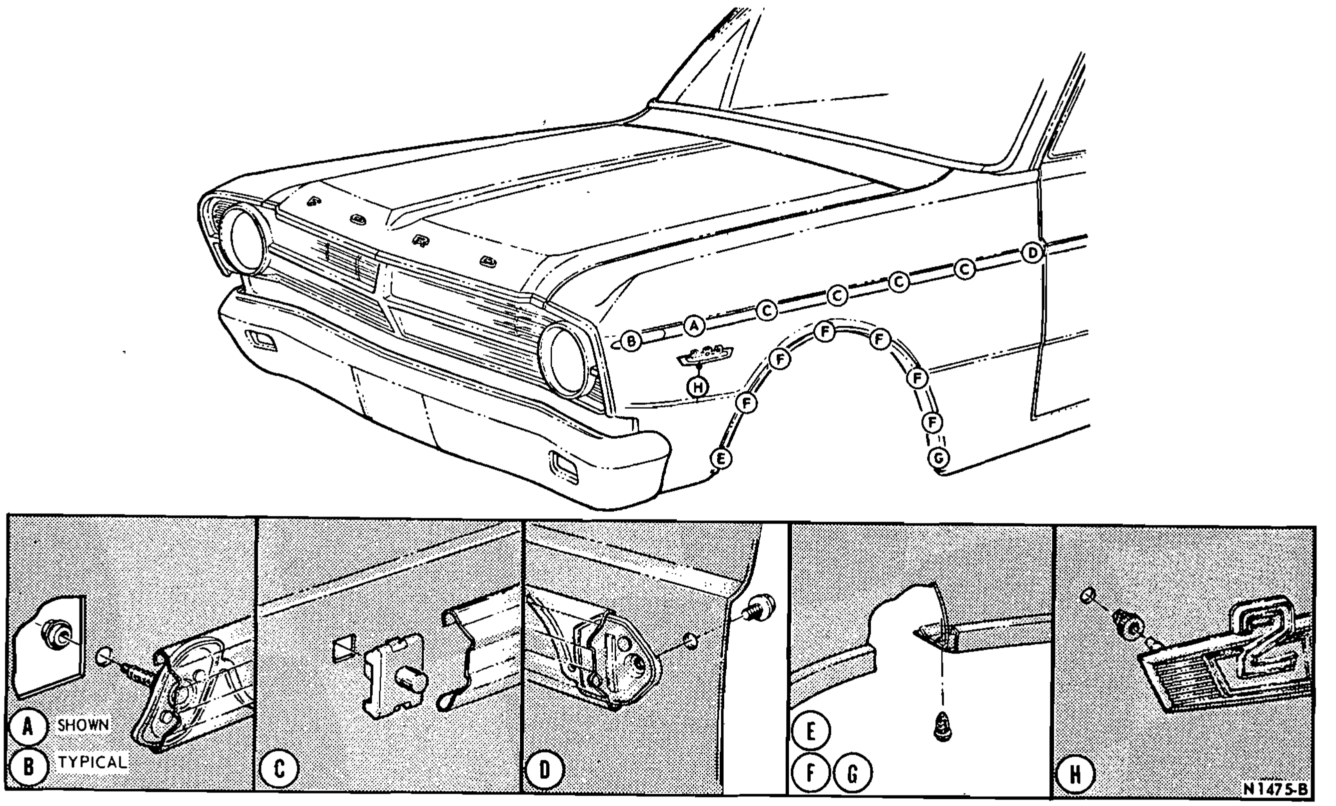


FIG. 18—Falcon Exterior Front Mouldings

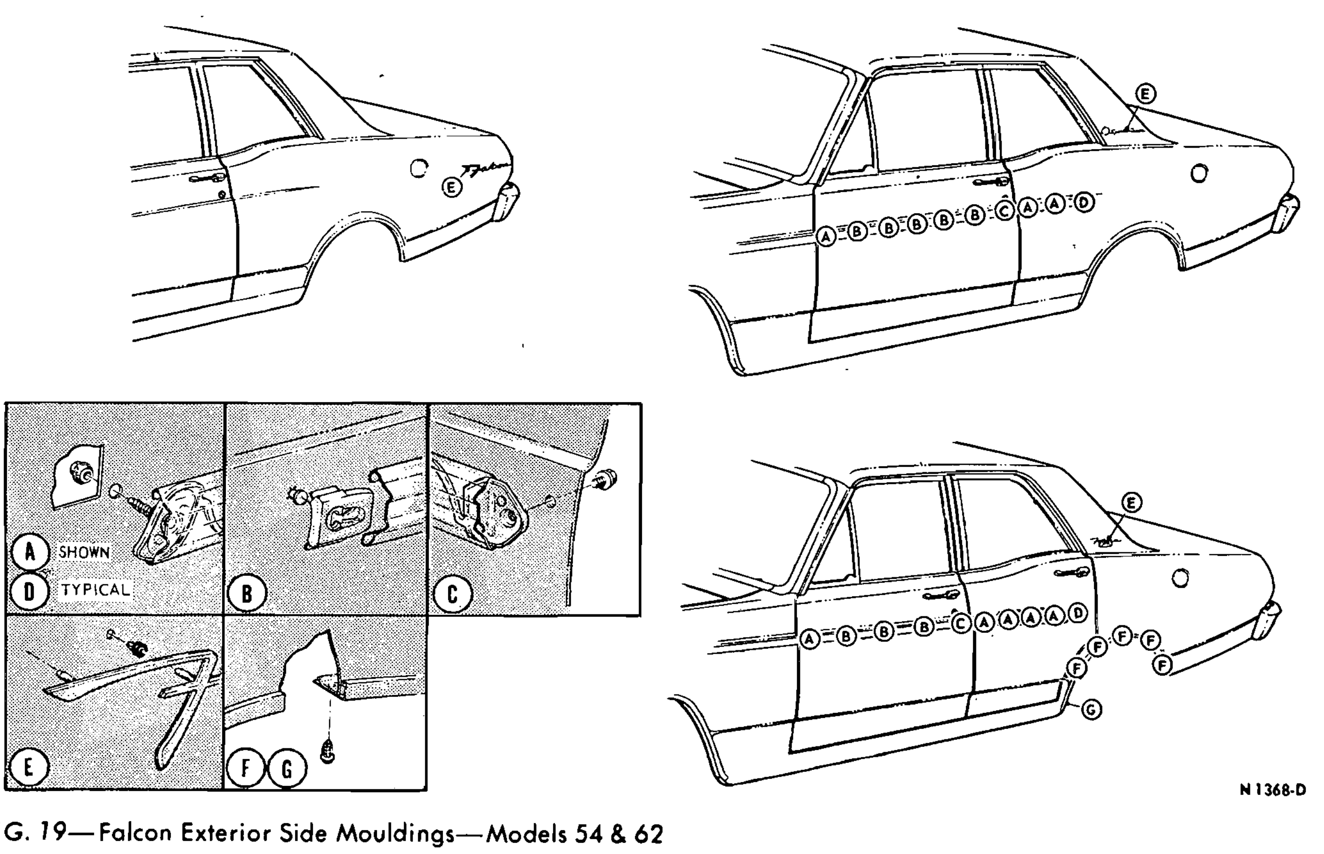


FIG. 19—Falcon Exterior Side Mouldings—Models 54 & 62

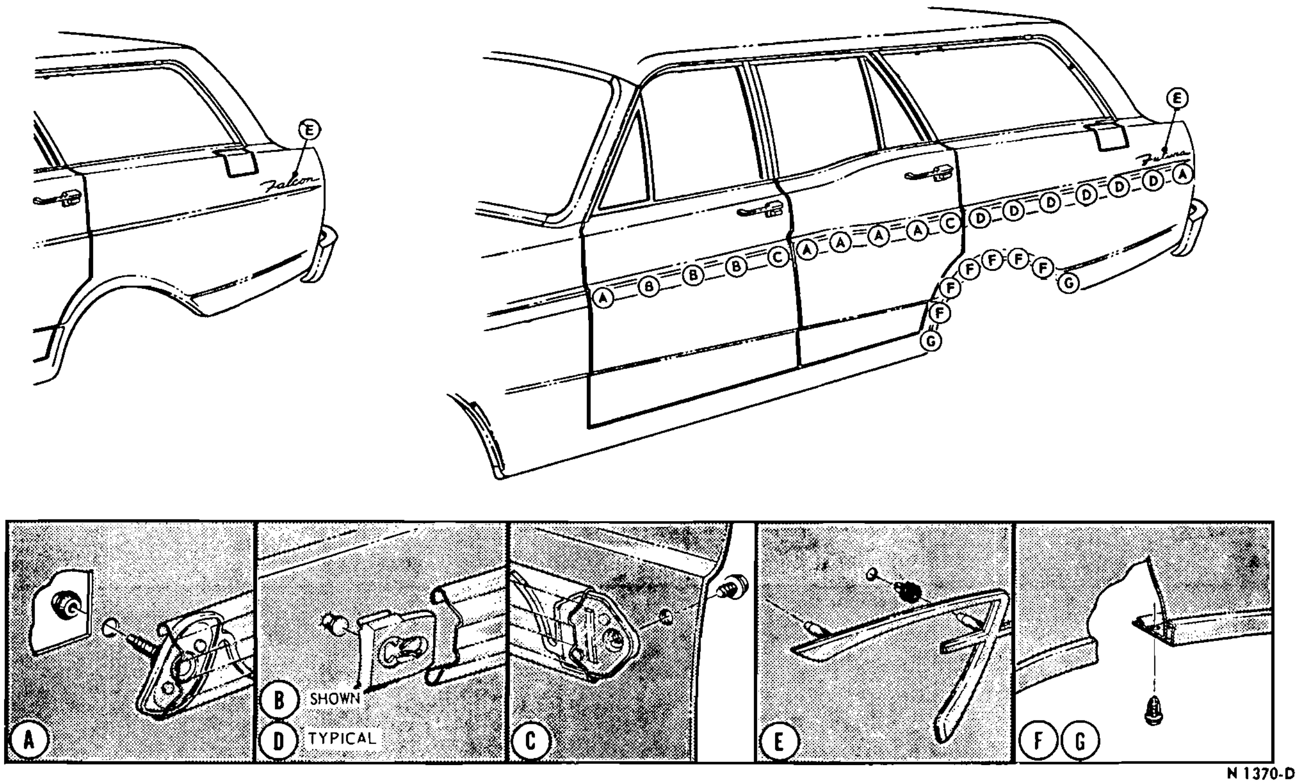


FIG. 20— Falcon Exterior Side Mouldings—Model 71

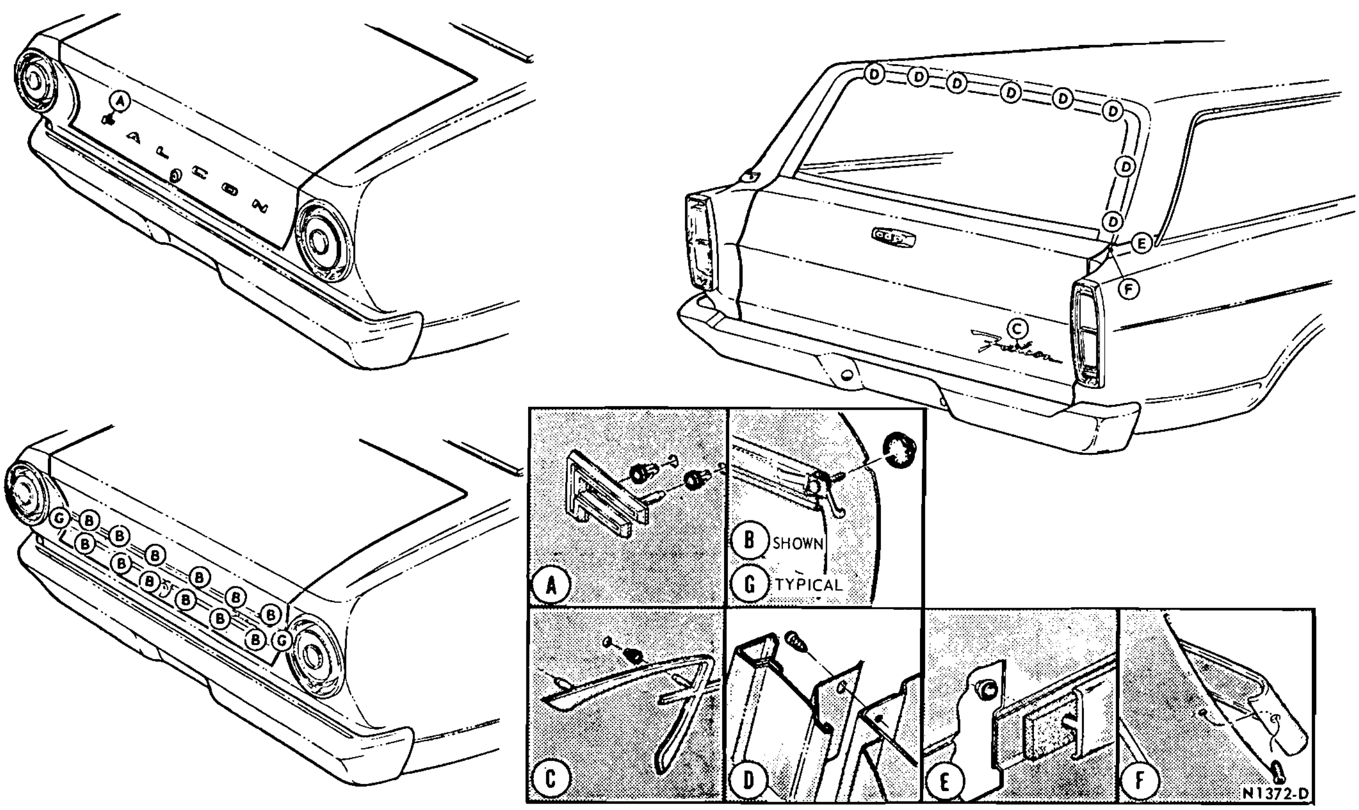


FIG. 21— Falcon Exterior Rear Mouldings

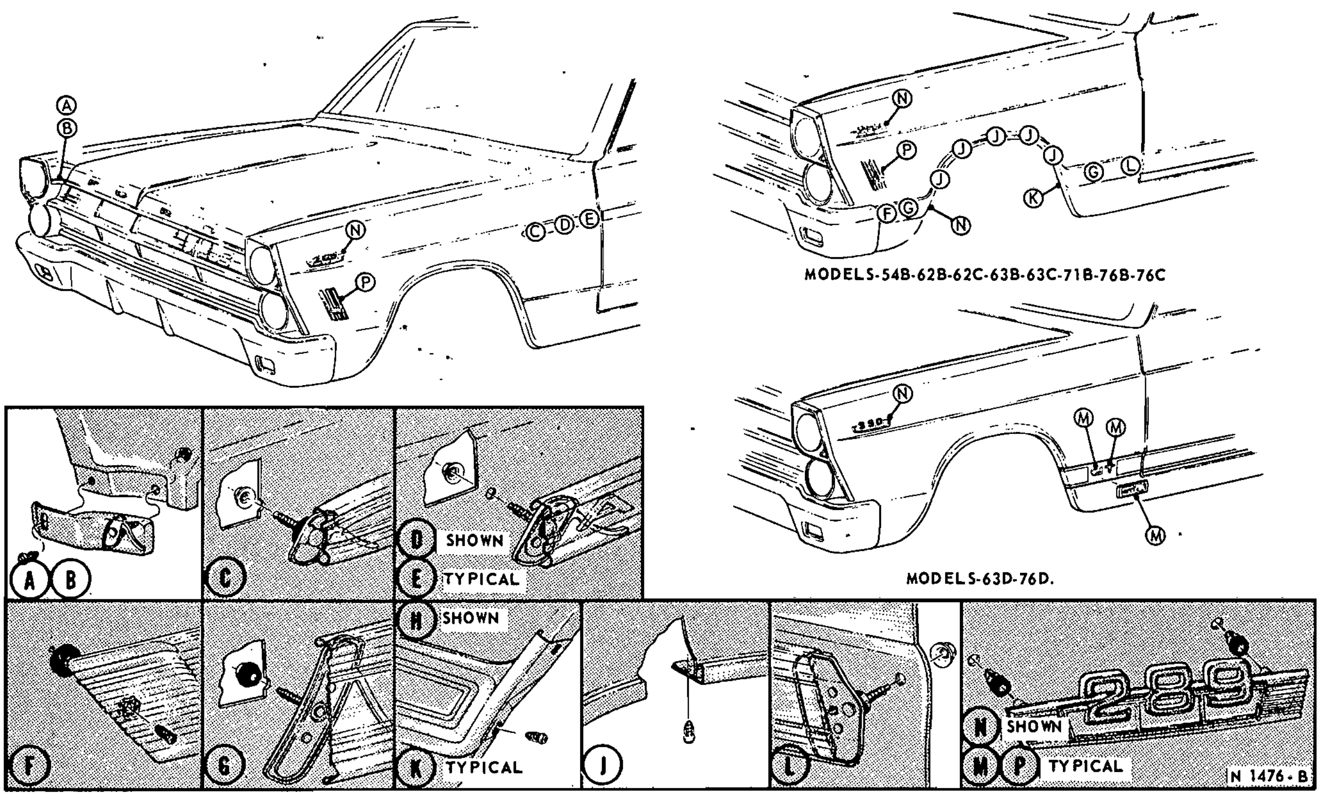


FIG. 22— Fairlane Exterior Front Mouldings

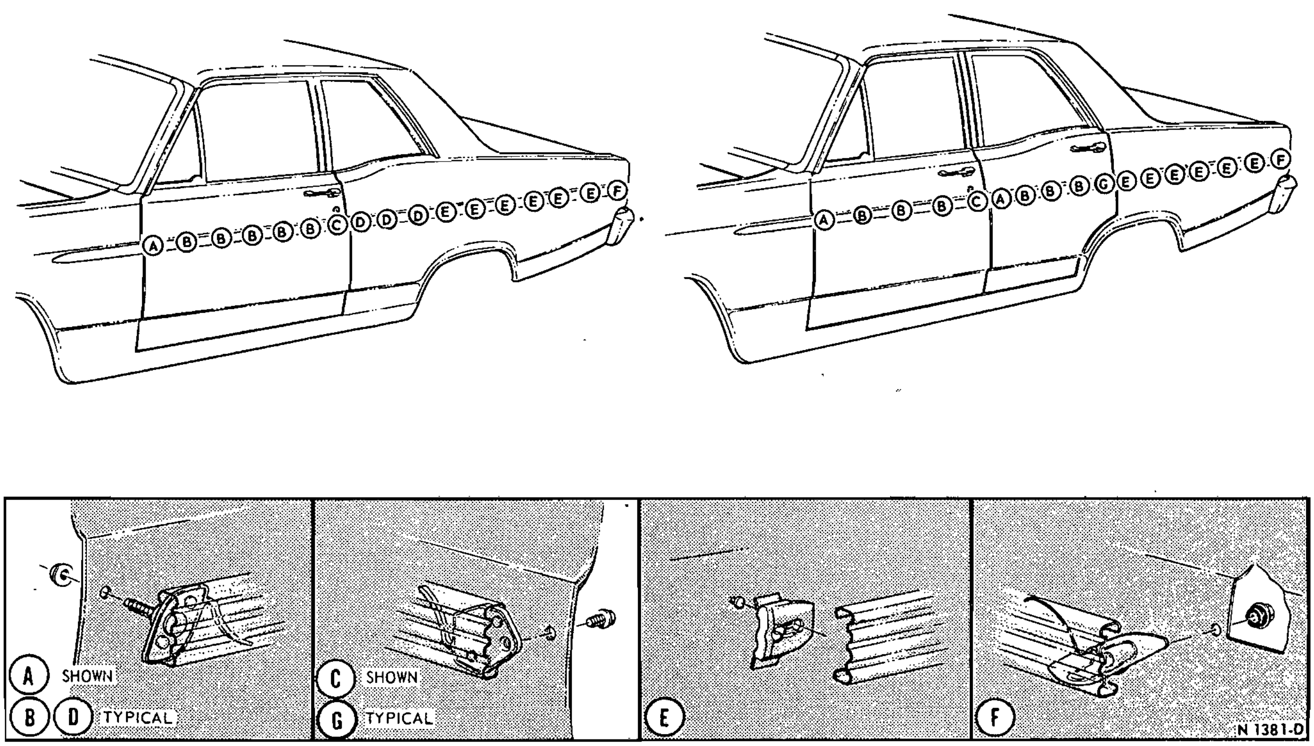


FIG. 23— Fairlane Exterior Side Mouldings—Models 54A & 62A

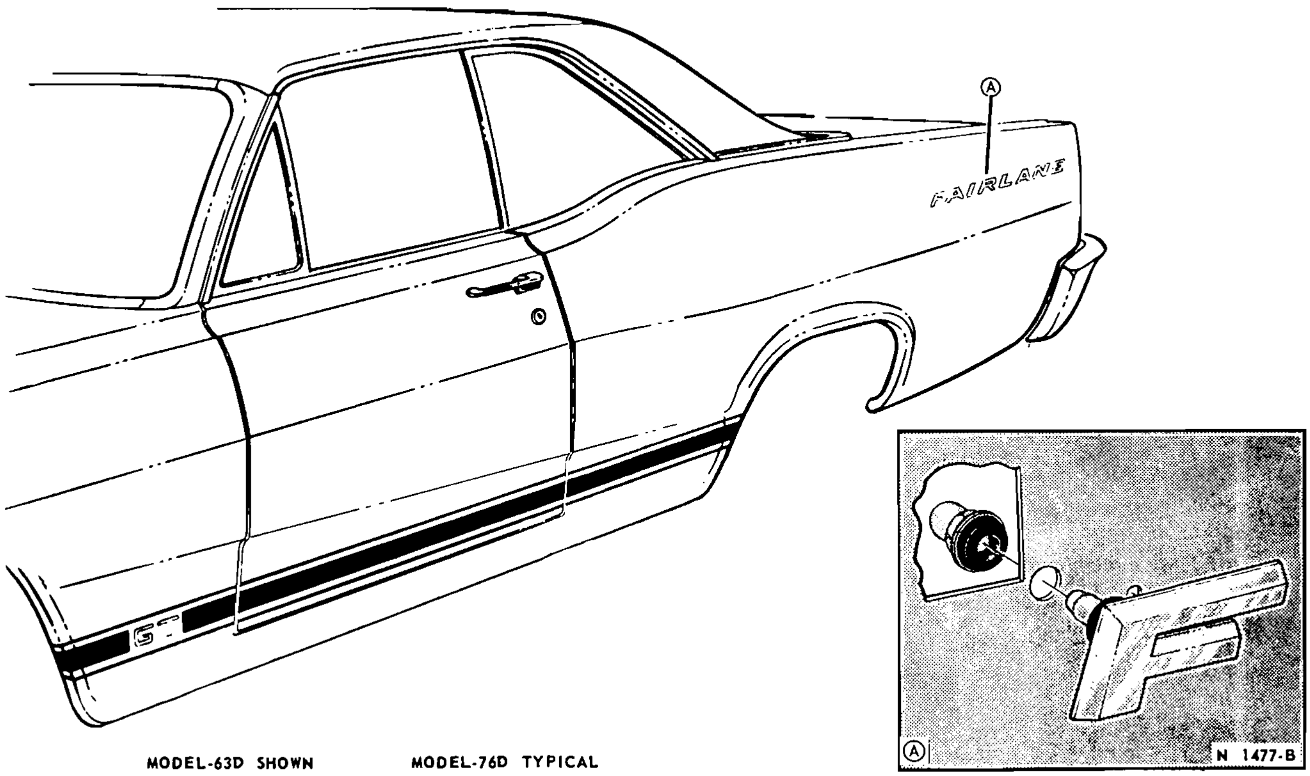


FIG. 24— Fairlane Exterior Side Mouldings—Models 63D, 76D

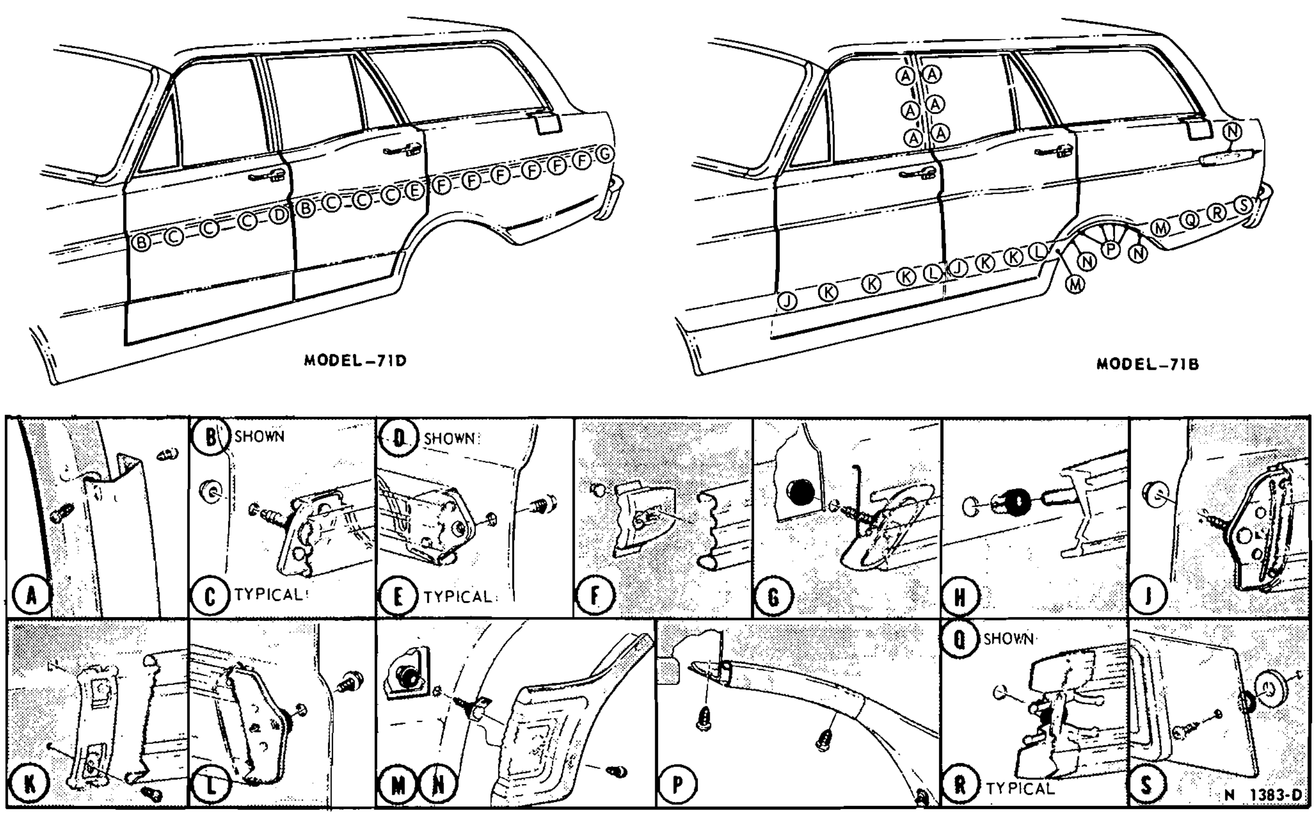


FIG. 25— Fairlane Exterior Side Mouldings—Model 71

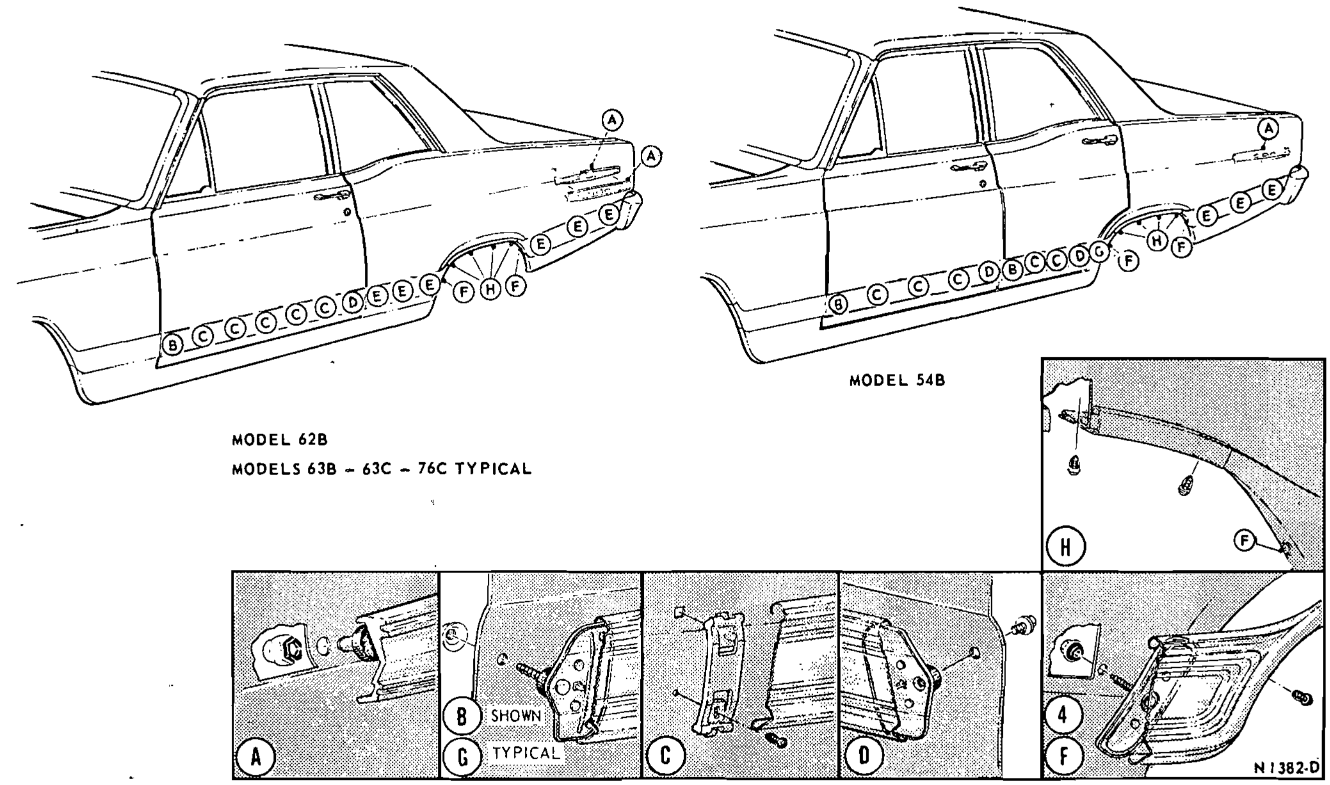


FIG. 26—Fairlane Exterior Side Mouldings—Models 54B-62B-63B & C-76B & C

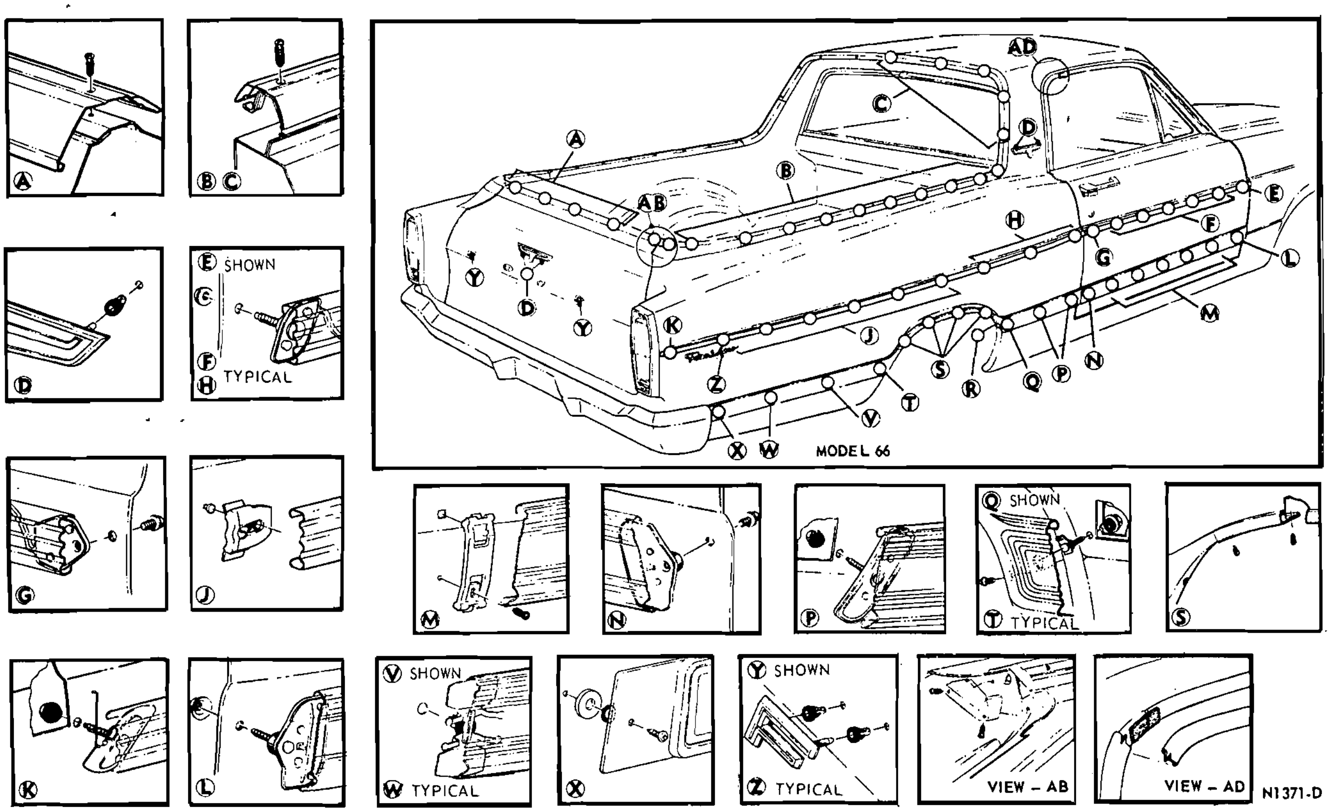


FIG. 27—Fairlane Exterior Side and RearMouldings—Models 66A, B, and D

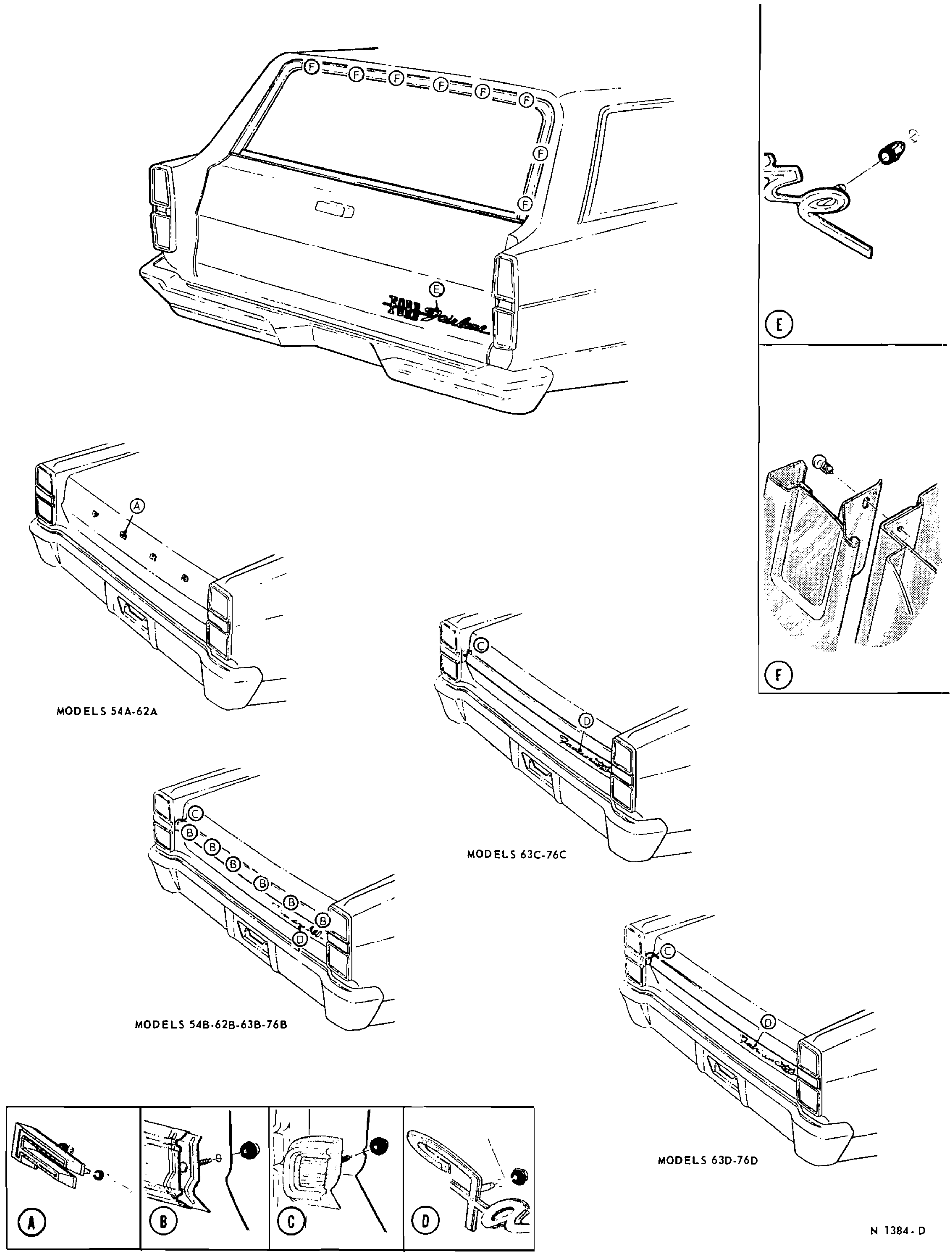


FIG. 28—Fairlane Exterior Rear Mouldings

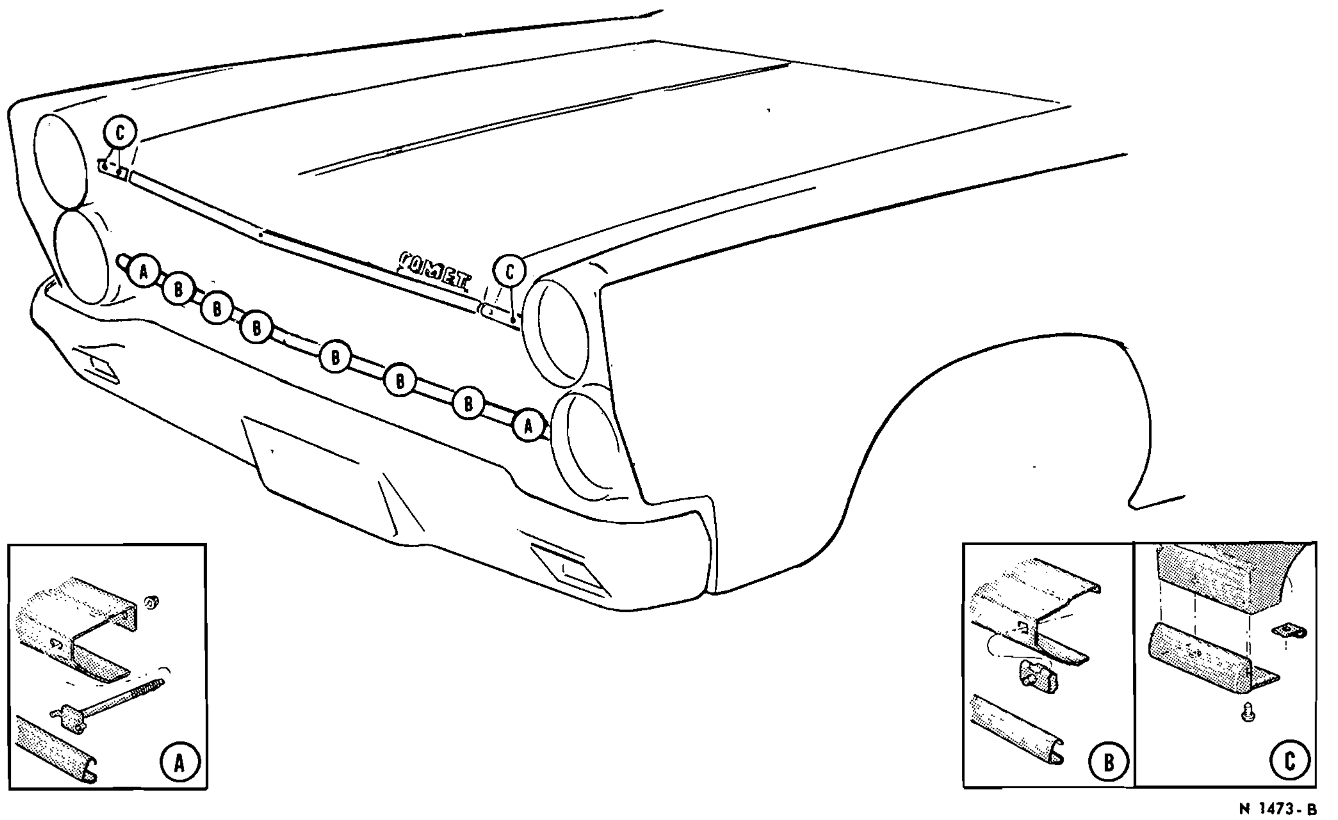


FIG. 29—Mercury Intermediate Exterior Front Mouldings

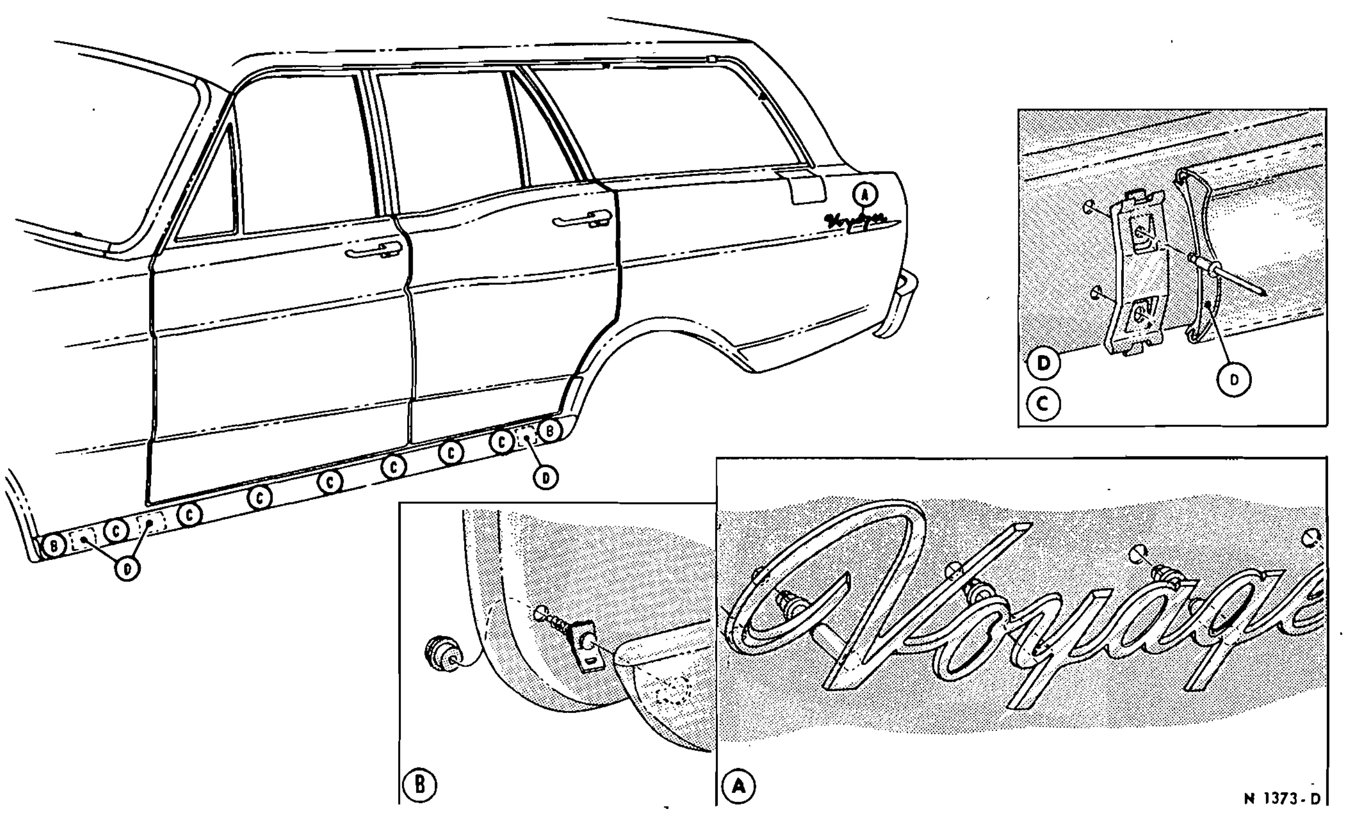


FIG. 30—Mercury Intermediate Exterior Side Mouldings—Model 71A

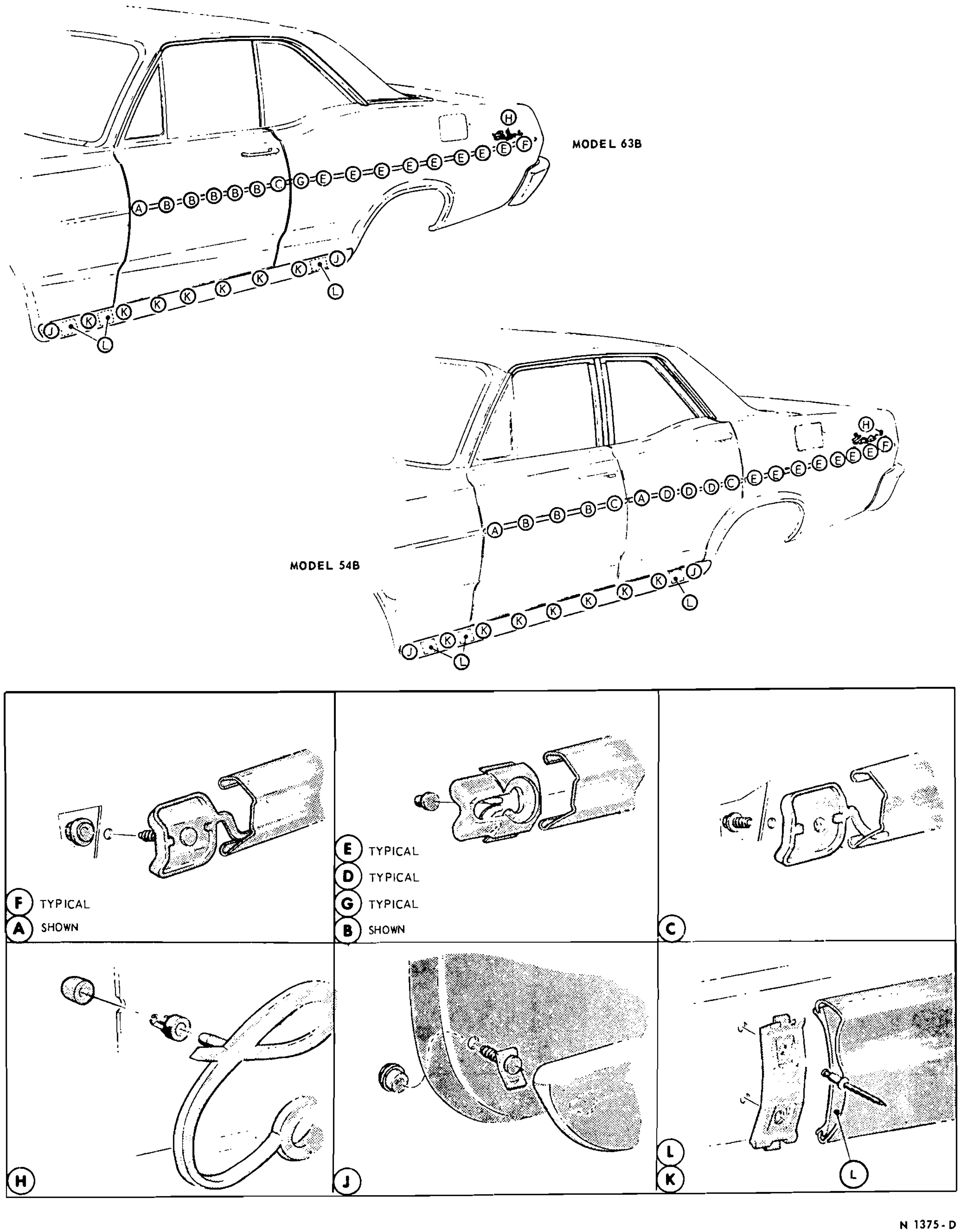


FIG. 31—Mercury Intermediate Exterior Side Mouldings—Models 54B, 63B, 71C

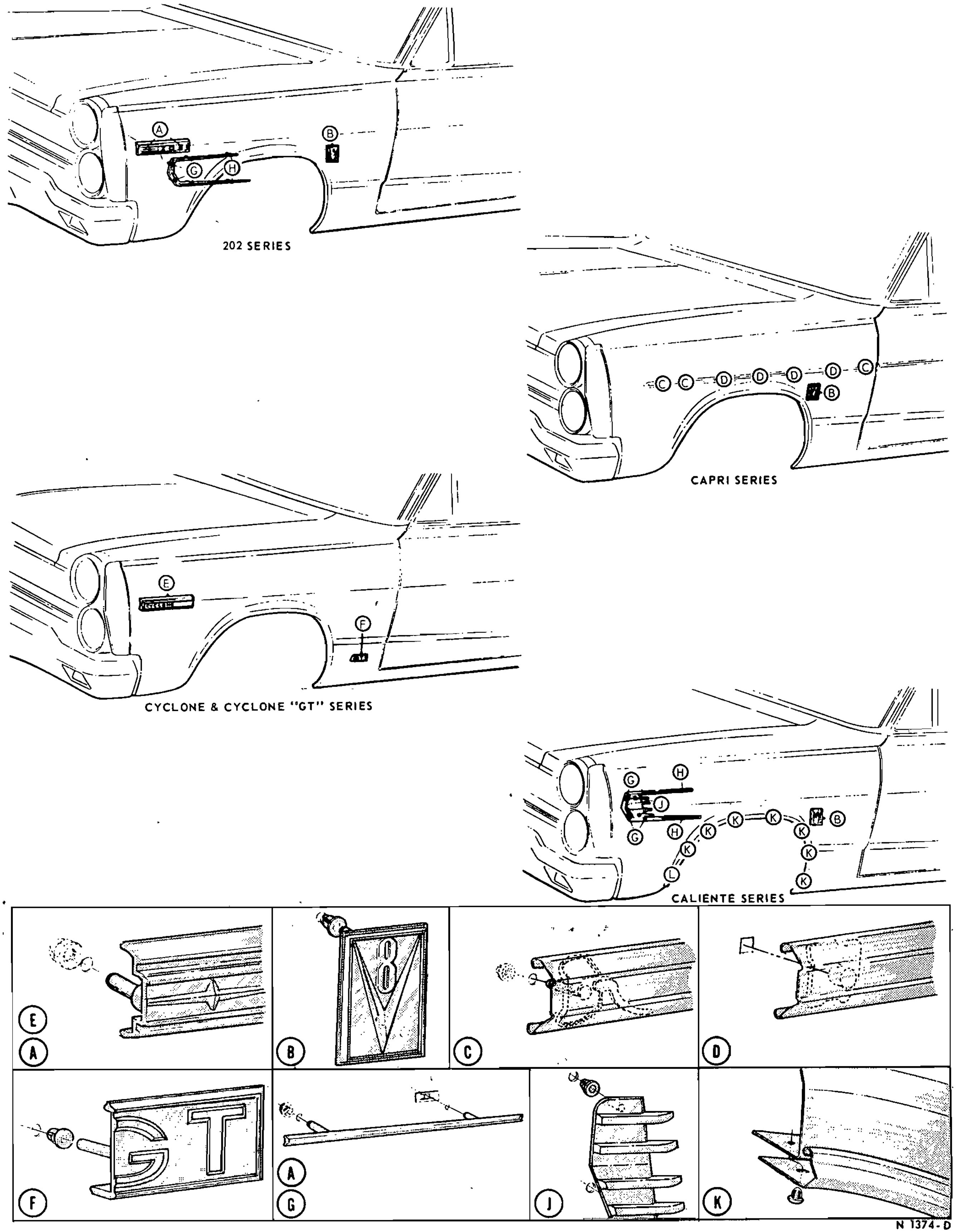
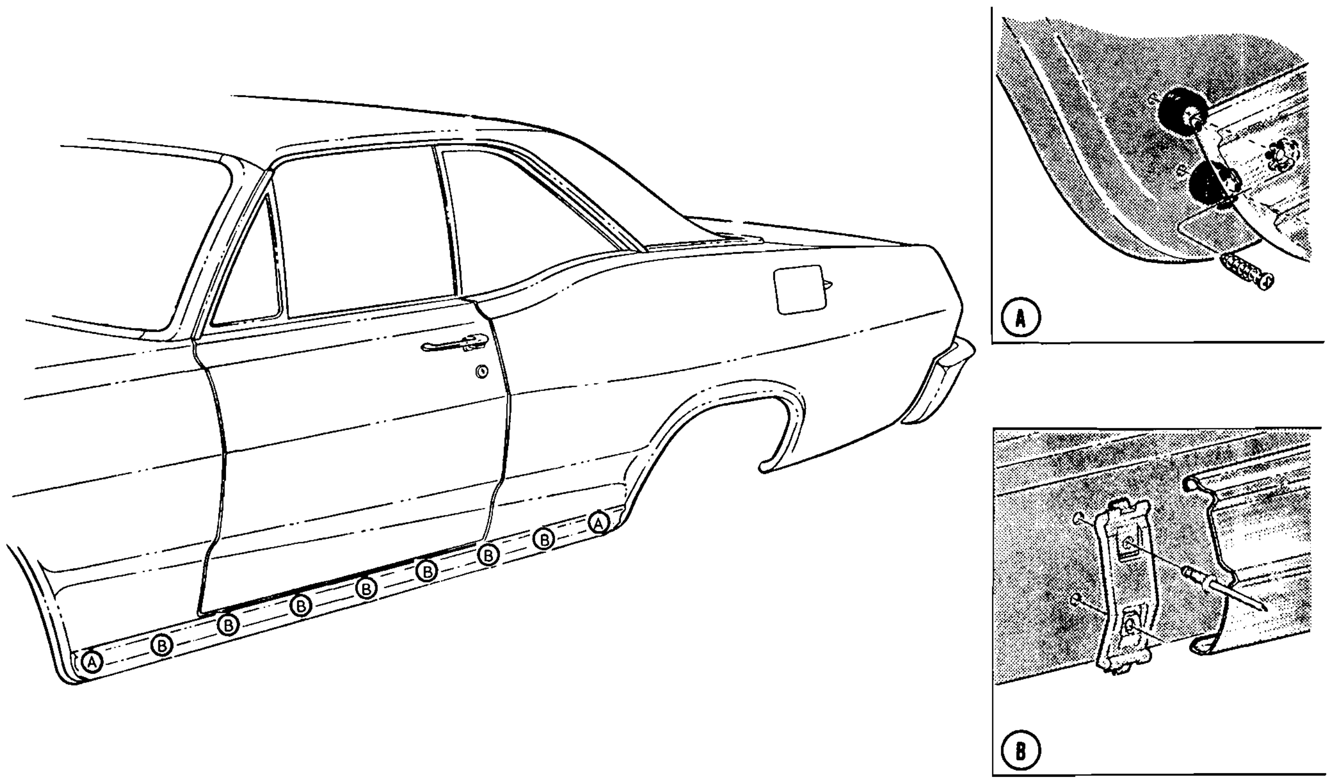
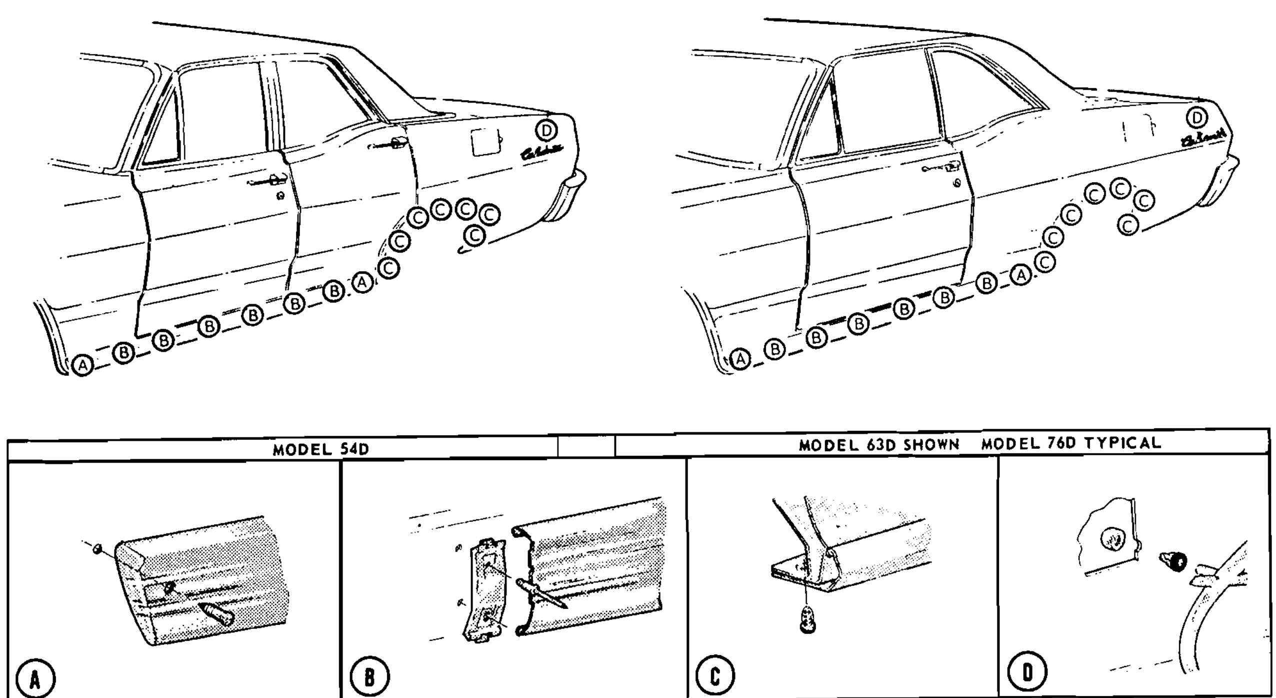


FIG. 32—Mercury Intermediate Exterior Front Side Mouldings



MODEL 63E SHOWN MODEL 67C TYPICAL N 1376-D

FIG. 33— Mercury Intermediate Exterior Side Mouldings—Models 63E, 63H, 76C, 76H



N 1527-A

FIG. 34— Mercury Intermediate Exterior Side Mouldings—Models 54D, 63D, 76D

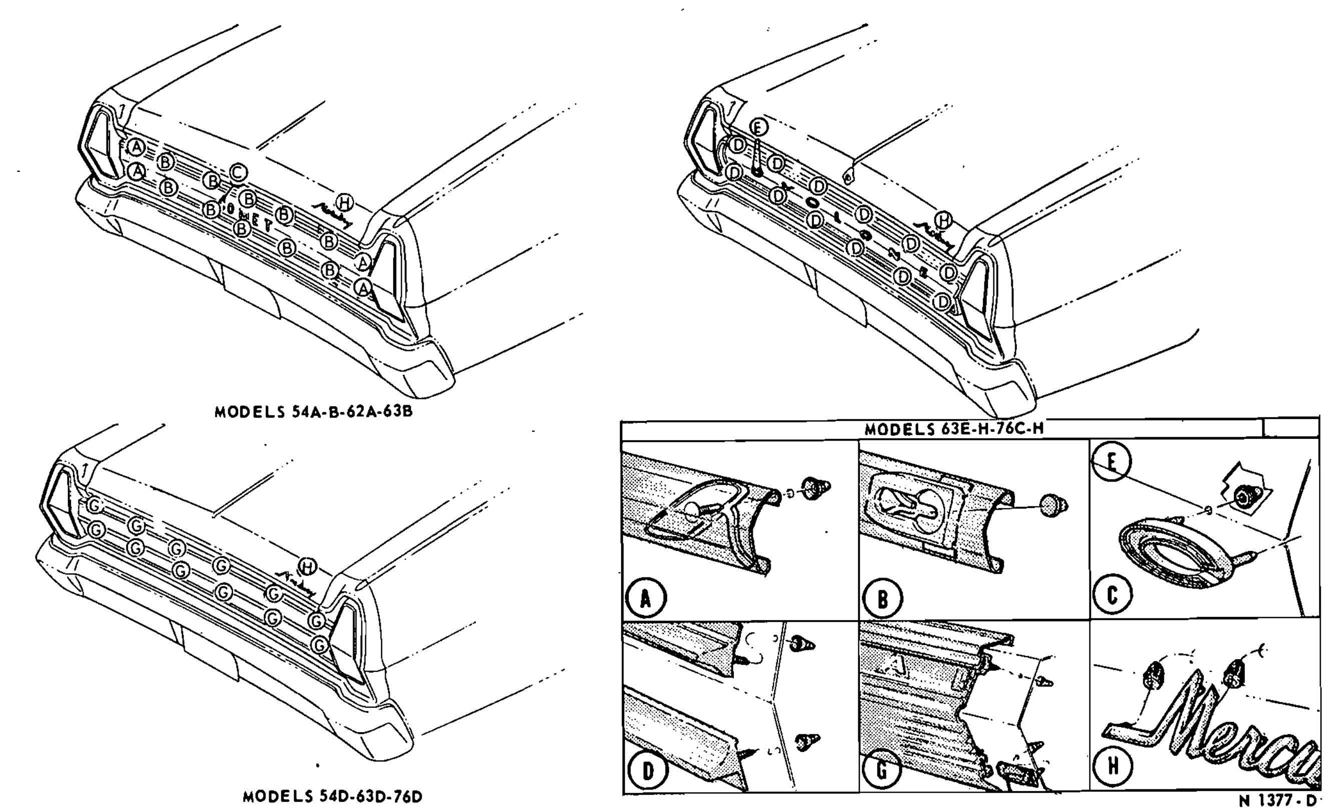


FIG. 35—Mercury Intermediate Exterior Rear Mouldings—All Except Model 71

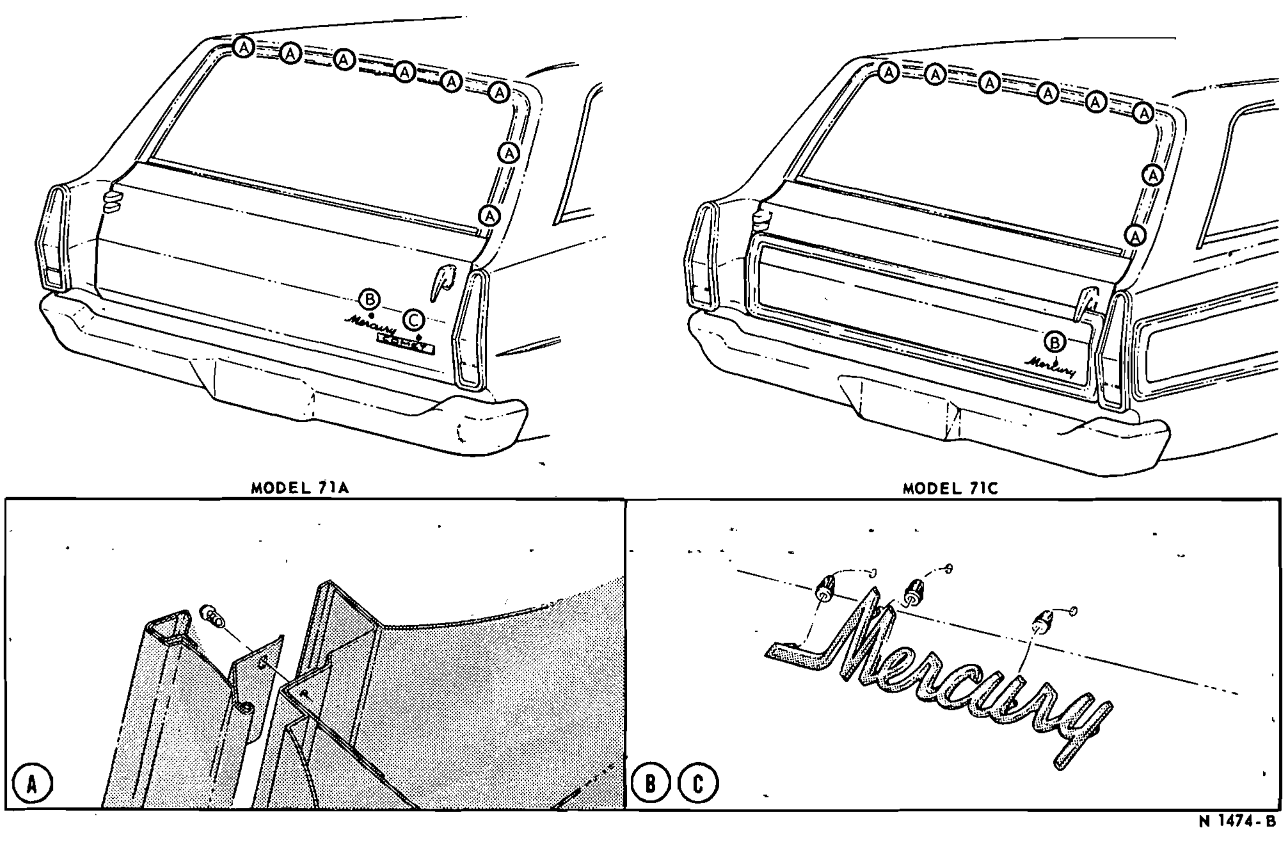


FIG. 36—Mercury Intermediate Exterior Rear Mouldings—Model 71

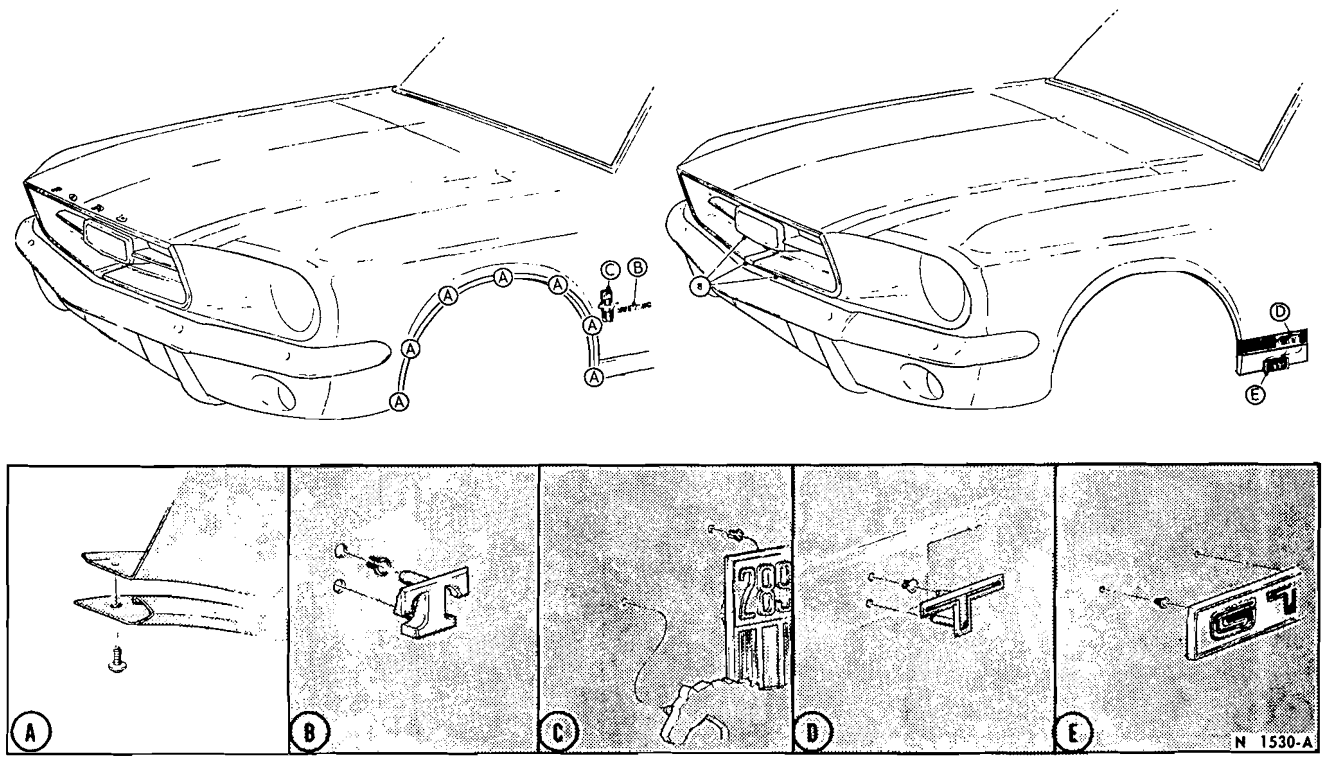


FIG. 37— Mustang Exterior Front Mouldings

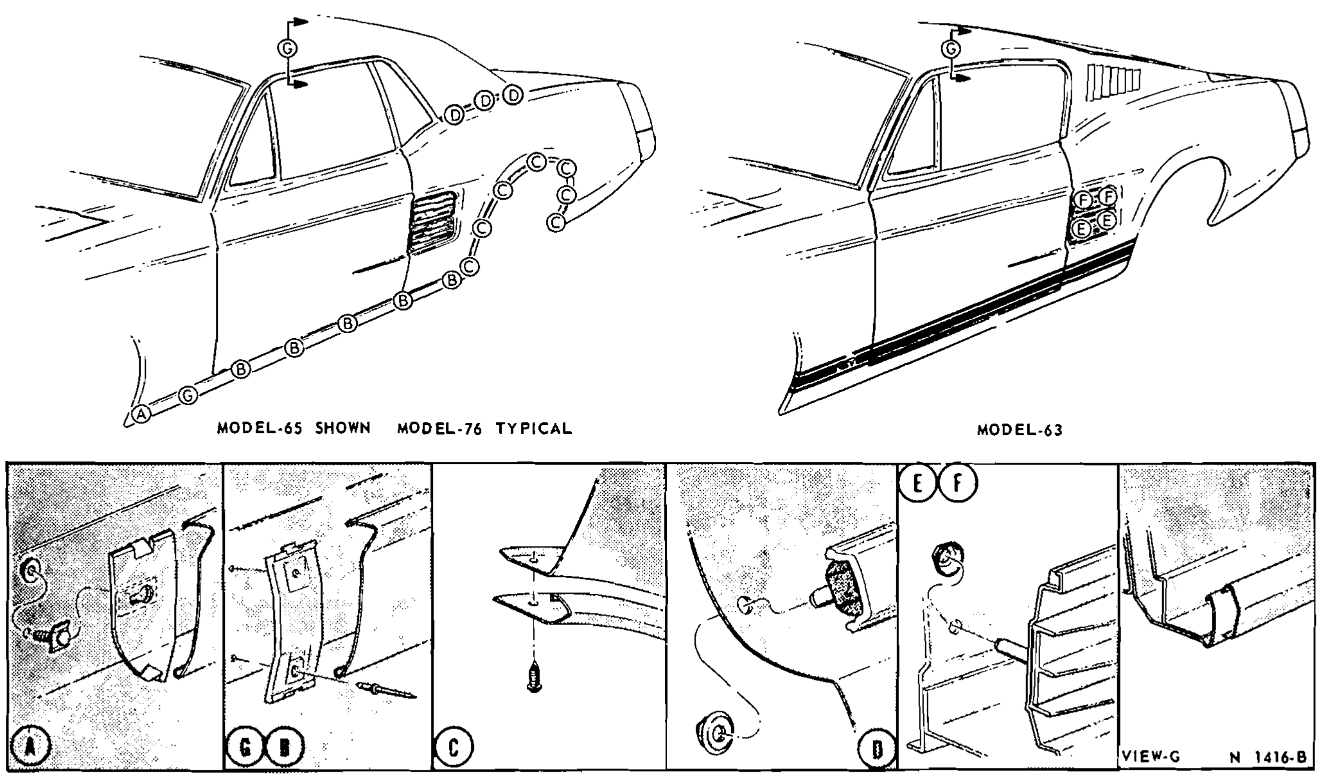


FIG. 38— Mustang Exterior Side Mouldings

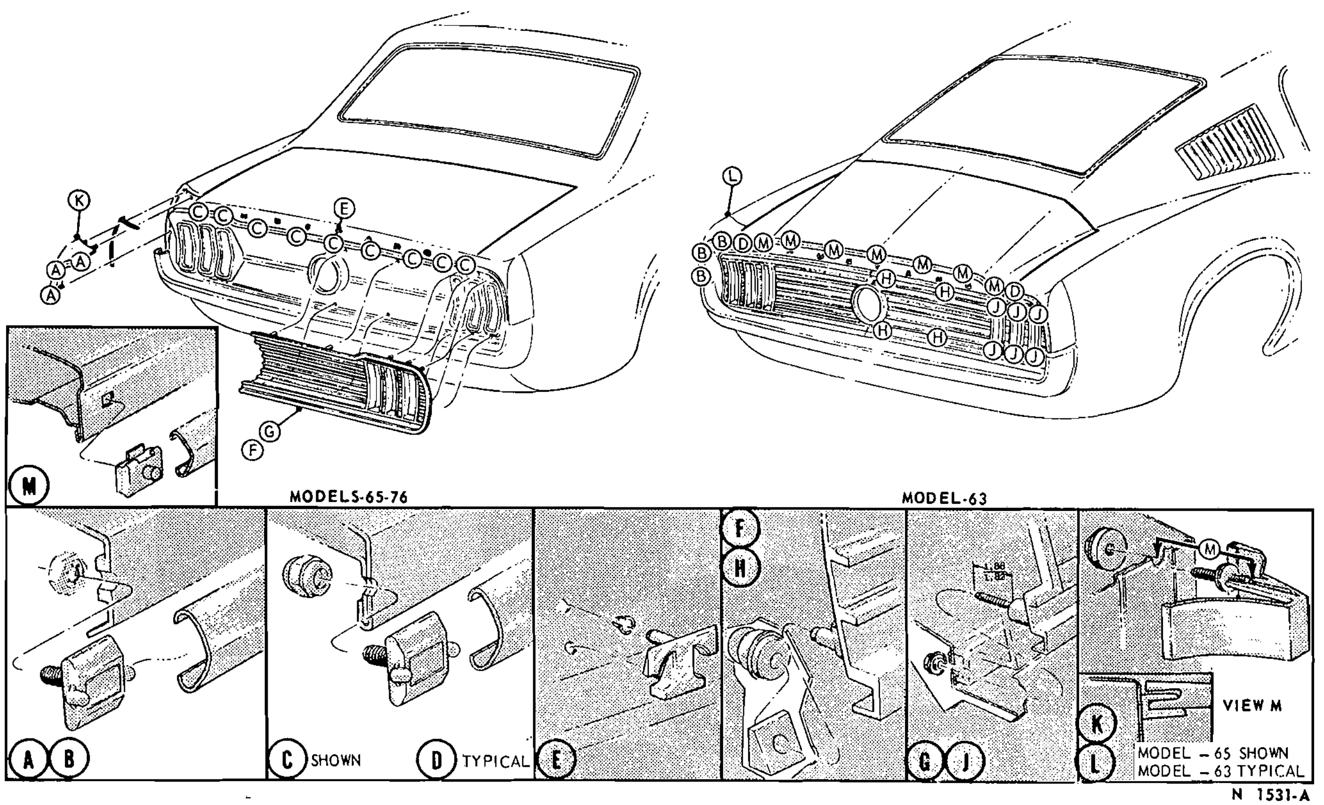


FIG. 39—Mustang Exterior Rear Mouldings

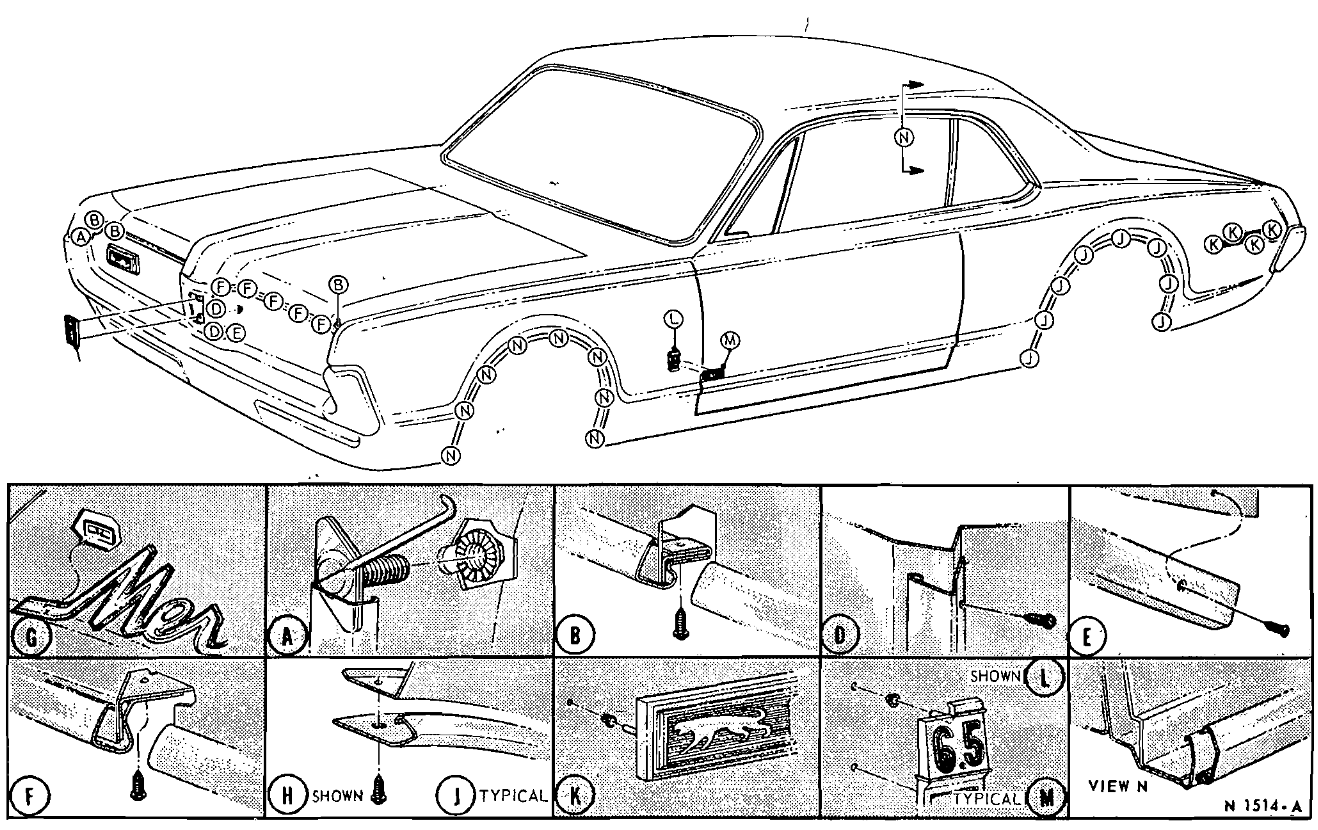


FIG. 40—Cougar Front and Side Exterior Mouldings

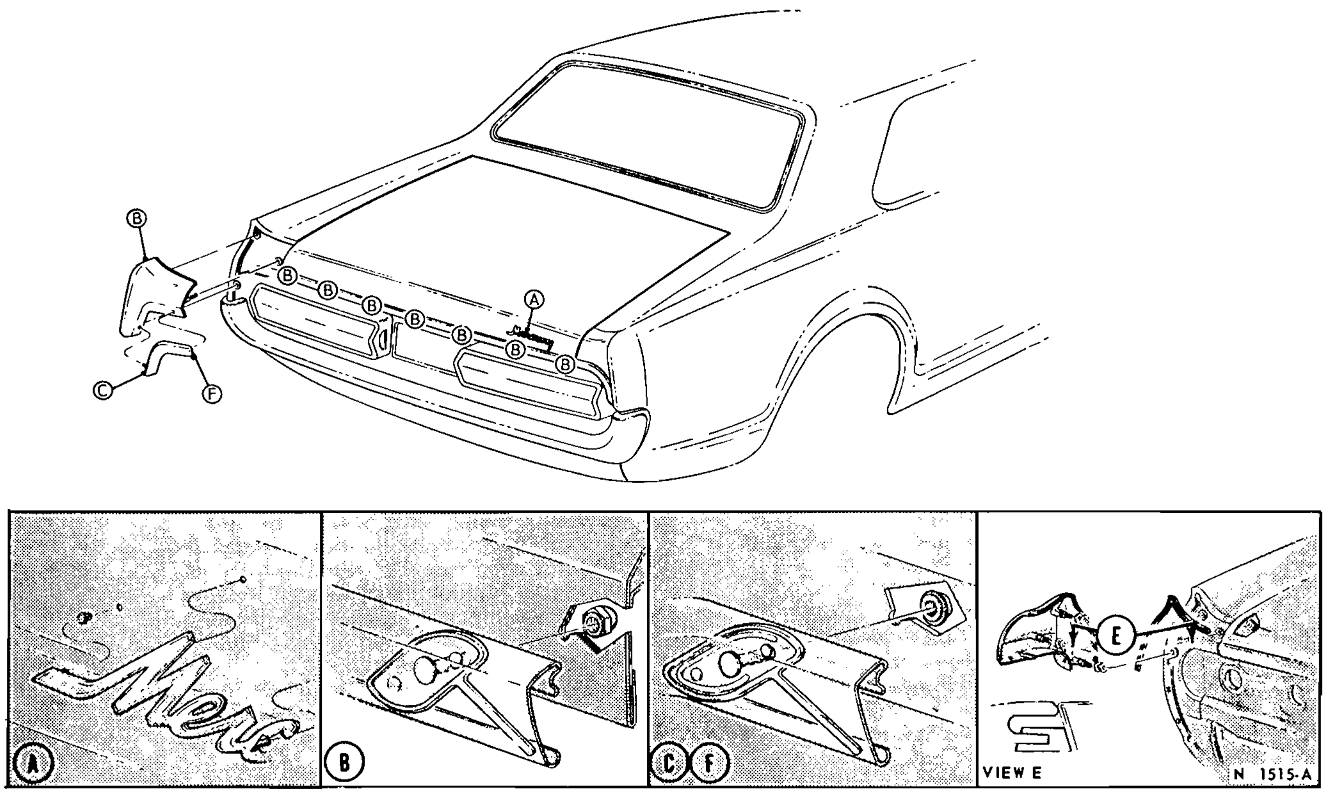


FIG. 41—Cougar Rear Exterior Mouldings

PART 17-3—Doors, Windows, Tailgate and Deck Lid

1 IN-VEHICLE ADJUSTMENTS AND REPAIRS

DOOR ALIGNMENT

The door hinges provide sufficient adjustment to correct most misalignment conditions. Loosen the door hinge attaching bolts and adjust the door so that it is centered in the door opening when closed. Then, tighten the hinge attaching bolts.

After adjustment at the hinge attaching points, check the alignment between the door latch and striker plate for proper door closing. **Do not cover up poor door adjustment with striker plate adjustment.**

LATCH STRIKER ADJUSTMENT

The striker pin can be adjusted laterally and vertically as well as fore and aft. **The latch striker should not be adjusted to correct door sag.** The latch striker should be shimmed to get the clearance shown in Fig. 1 between the striker and the latch. To check this clearance, clean the latch jaws and the striker area, and then apply a thin layer of dark grease to the striker. As the door is closed and opened, a measureable pattern will result. Move the striker assembly laterally to provide a flush fit at the door and the pillar or quarter panel.

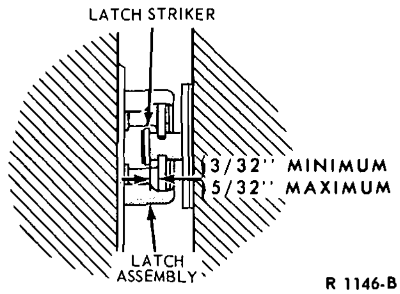


FIG. 1— Door Latch Striker Adjustment

VENT WINDOW ADJUSTMENTS—FALCON, FAIRLANE AND MERCURY INTERMEDIATE EXCEPT MODELS 63, 76

The vent glass and/or the vent window frame may be adjusted in various ways. With the vent glass installed, the lower pivot spring tension may be adjusted with a socket, extension, and ratchet used through the access hole in the door inner panel. Adjust so that the glass will stay open at highway speeds. The door frame mounting holes are elongated to provide a tight fit for the vent window frame in the door frame. The upper pivot mounting holes are slotted to help provide a weather-proof fit of the glass frame within the vent window frame.

DOOR GLASS ADJUSTMENT—MERCURY INTERMEDIATE AND FAIRLANE—MODELS 63, 76

The door must be properly aligned in the body opening before glass adjustments are made.

1. Remove the door trim panel and peel back the watershield to provide access.

2. Loosen screw and washer assemblies A, J, Z and AB, also nuts C, E and L (Fig. 2).

3. Cycle the window to its up position and manually position the window assembly inboard or outboard, as required, for proper alignment to the outside belt weatherstrip and tighten the screw and washer assemblies J.

4. Tilt the window assembly fore or aft as required, to obtain a parallel relationship between the top of the window and the roof rail weatherstrip. This will position the rear guide assembly in correct fore and aft alignment. Tighten nut L temporarily. Turn screw G clockwise or counter-clockwise, as re-

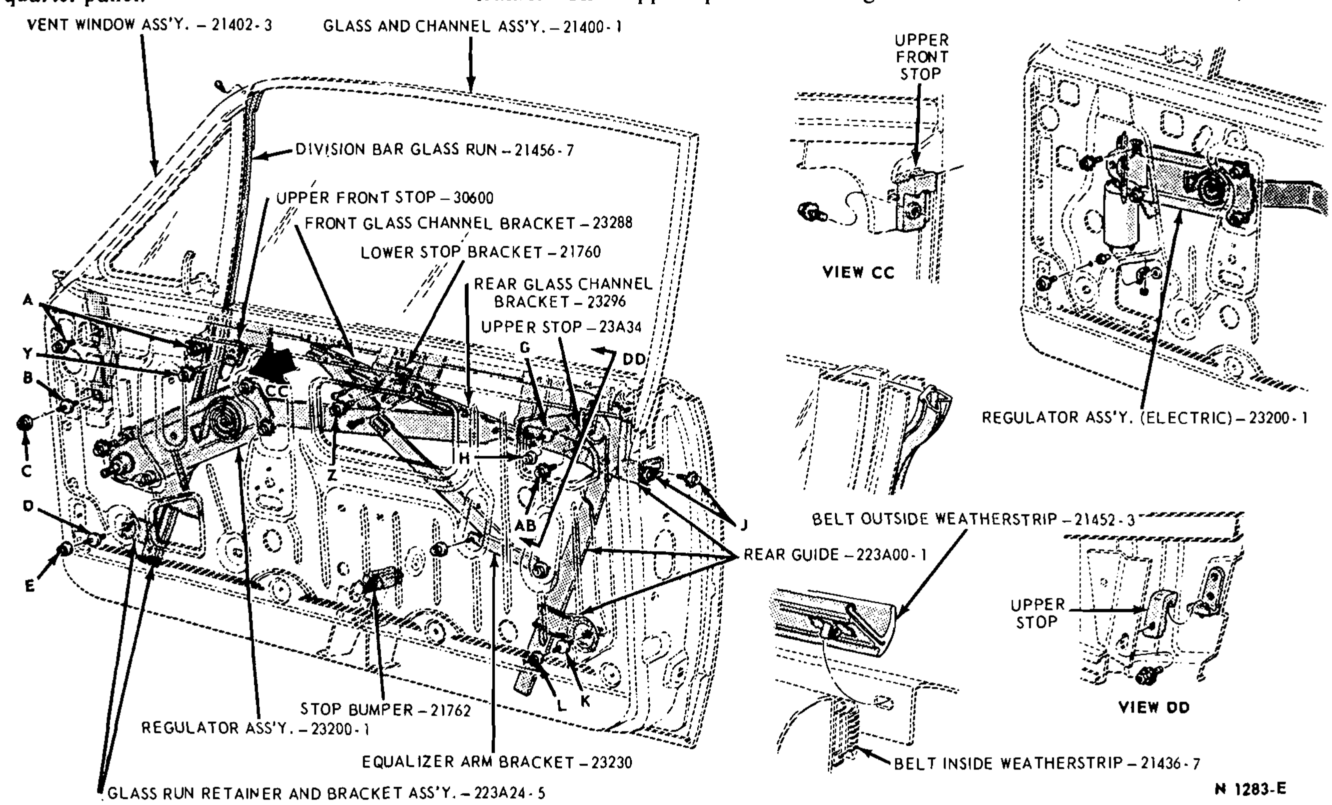


FIG. 2— Door Window Mechanism—Mercury Intermediate and Fairlane Models 63, 76

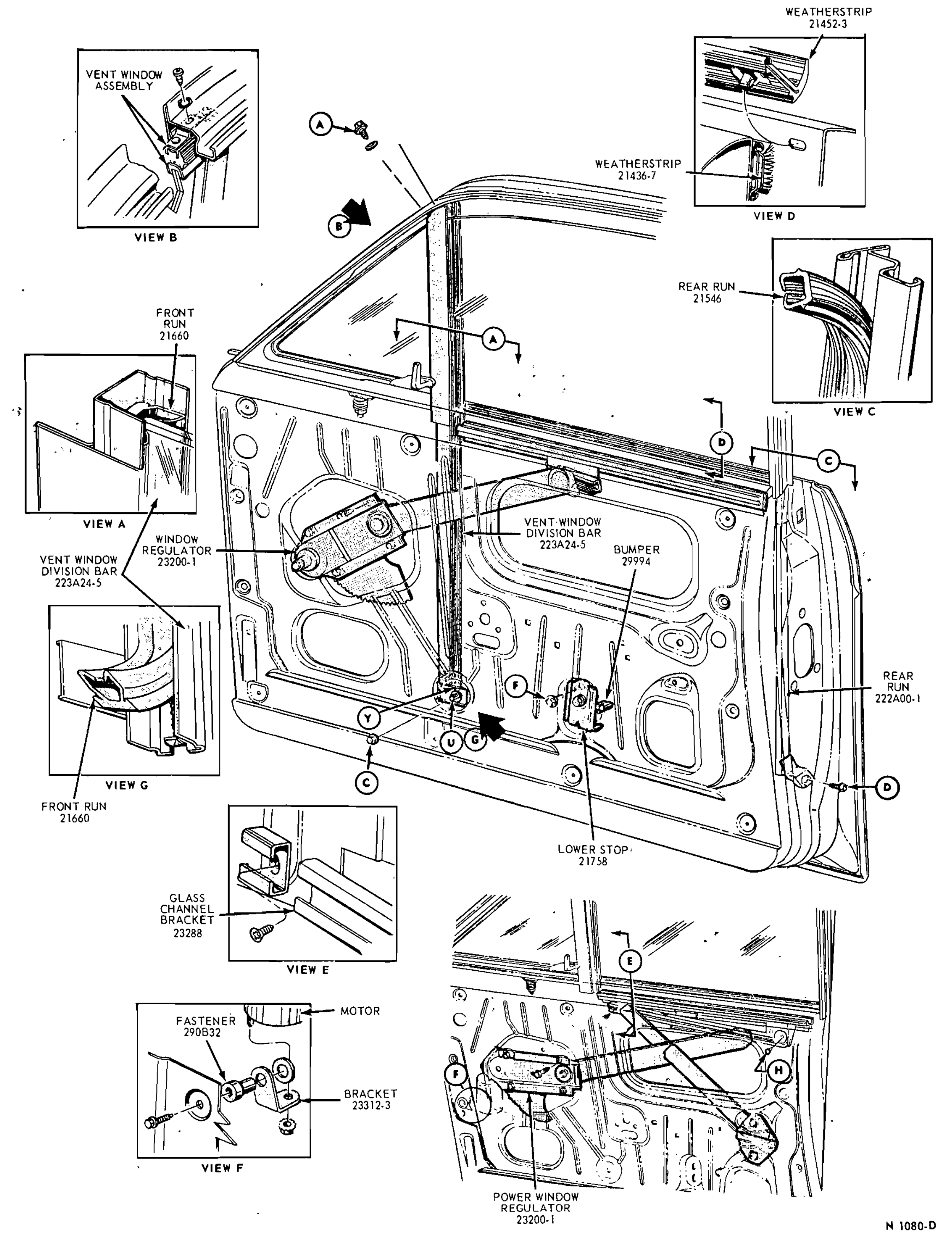


FIG. 3—Front Door Window Mechanism—Model 54 and 71

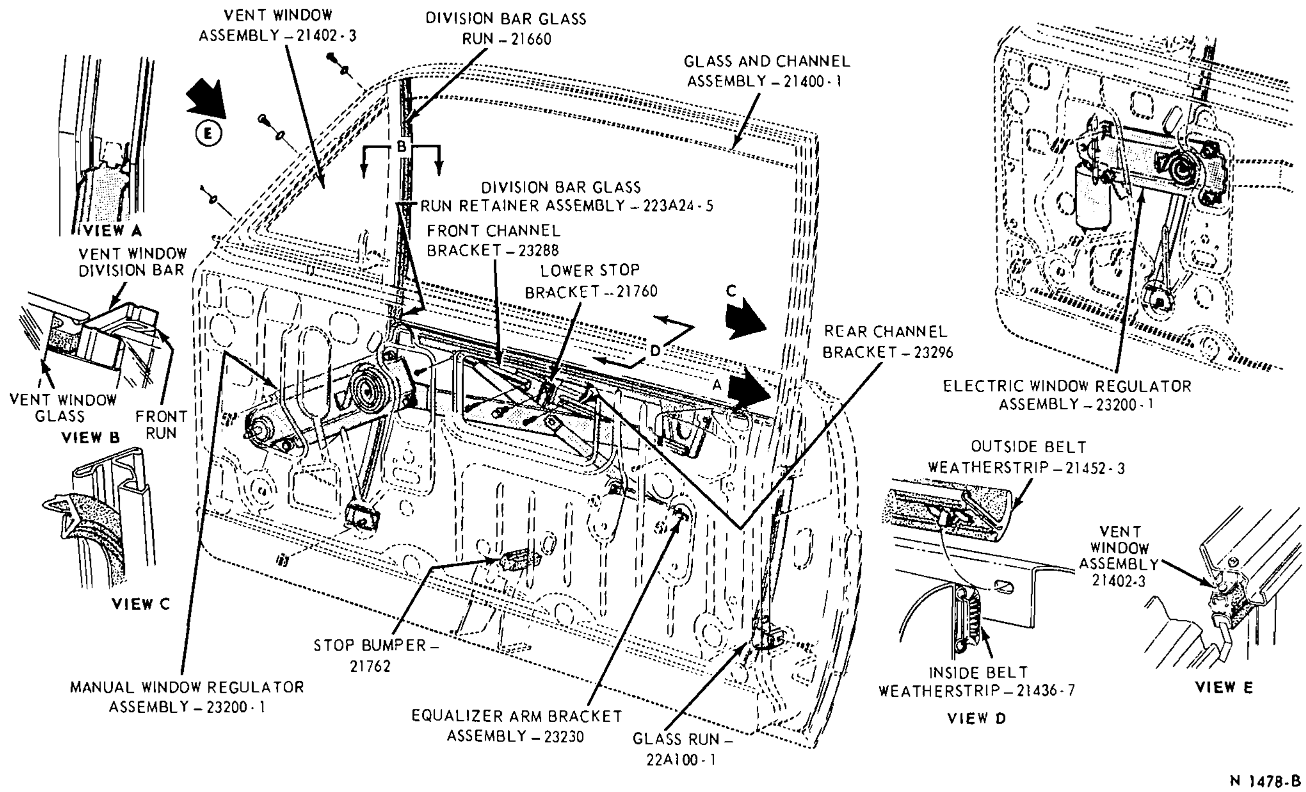


FIG. 4—Door Window Mechanism—Falcon, Mercury Intermediate, Fairlane— Model 62 and 66

quired, to maintain position of the guide assembly and tighten nut and washer assembly H securely. At this point, adjust the door window stop assemblies up or down as required, for correct engagement. Tighten the screw and washer assemblies, Y and AB securely.

5. Position the vent window assembly and vent window division bar glass run rearward, into a position relative to the door window glass and tilt fore and aft, as required, to maintain a parallel relationship to the front body pillar. Tighten the screw and washer assemblies A securely. The adjusted position of the vent window assembly should be such as to provide window travel free of binding.

6. To provide a proper interference relationship of the vent window and the door window assemblies to the top roof rail weatherstrip, tilt these assemblies inboard or outboard as required, by turning the screws, B, D and K clockwise or counterclockwise, to the desired setting and then tighten the nuts C, E and L securely. At this point, secure the vent window regulator assembly door vent window, by tightening the screw and the washer assemblies A securely.

7. When the above steps are completed, cycle the window down until the top of the window is flush with the belt and position the down stop assembly to the bumper door window stop and secure it with the screw and washer assemblies Z.

8. Install the watershield and the door trim panel.

FRONT DOOR GLASS ADJUSTMENT—FALCON, FAIRLANE, AND MERCURY INTERMEDIATE — MODELS 54, 71

1. Remove the trim panel and watershield from the door.

2. To obtain proper alignment of the rear run to the vent window division bar and front run, loosen the nut and washer assembly (Item C, Fig. 3) and the screw (Item D).

3. Lower the glass until the top edge of the glass is four inches above the belt line. Turn the screw (Item U, Fig. 3) clockwise or counterclockwise as required to bring the front run into alignment with the rear run. Then, tighten the nut (Item C) and the screw (Item D) to 8-23 FT-LB torque.

4. To obtain a flush condition between the top edge of the glass and the belt line when the glass is down, loosen the two lower stop attaching screws (Item F, Fig. 3).

5. Move the glass to a flush position with the belt line. Then, position the lower stop against the glass channel and tighten the attaching screws (Item F, Fig. 3) to 8-23 ft-lb torque.

6. Install the watershield and trim panel on the door.

DOOR GLASS ADJUSTMENT— FALCON, FAIRLANE AND MERCURY INTERMEDIATE— MODELS 62, 66

1. Remove the door trim panel and peel back the watershield to provide access. Refer to Fig. 4 for the following adjustments.

2. To obtain proper alignment of the lock side glass run retainer assembly to the door window frame and vent window division bar with the retainer, loosen nut and washer assembly D and screw and washer assembly E. Drop the top edge of the glass and channel assembly to approximately four inches above the door outer panel belt line. Turn screw C clockwise or counterclockwise as required. Tighten items D and E securely.

3. To obtain a flush condition between the top edge of the glass and channel assembly and the belt line when the window is in the down position, the stop assembly is adjusted up or down at screw and washer assemblies U. After adjust-

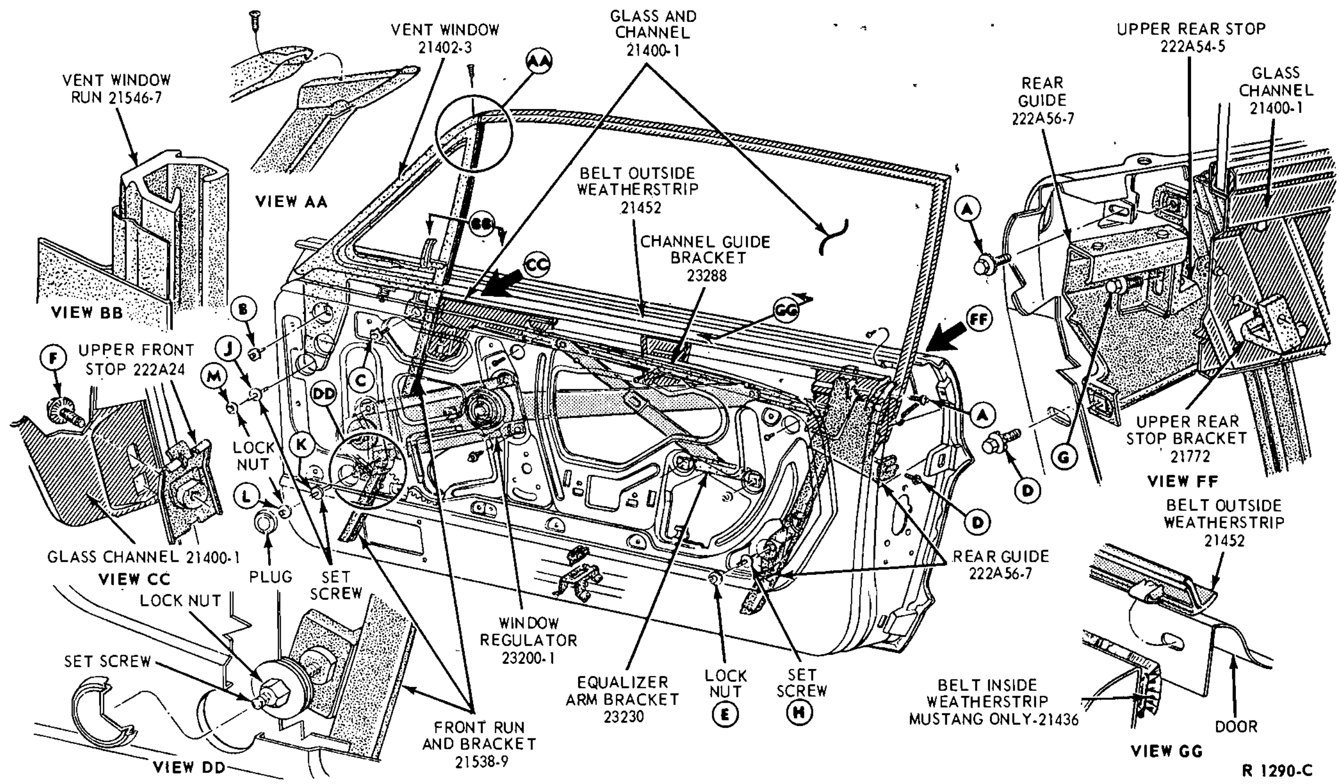


FIG. 5—Door Window Glass Adjustment—Mustang and Cougar

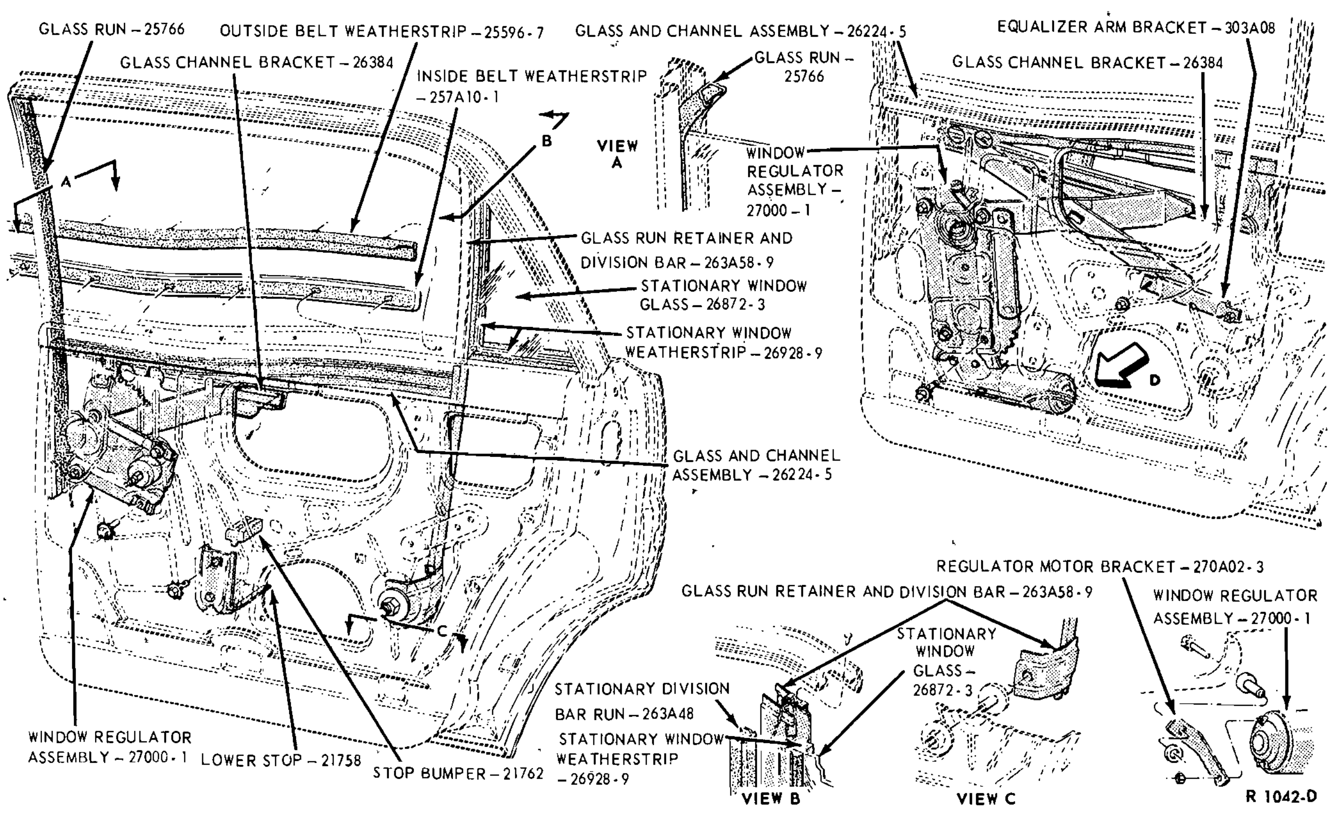


FIG. 6—Rear Door Window Mechanism—Mercury Intermediate, Falcon, Fairlane

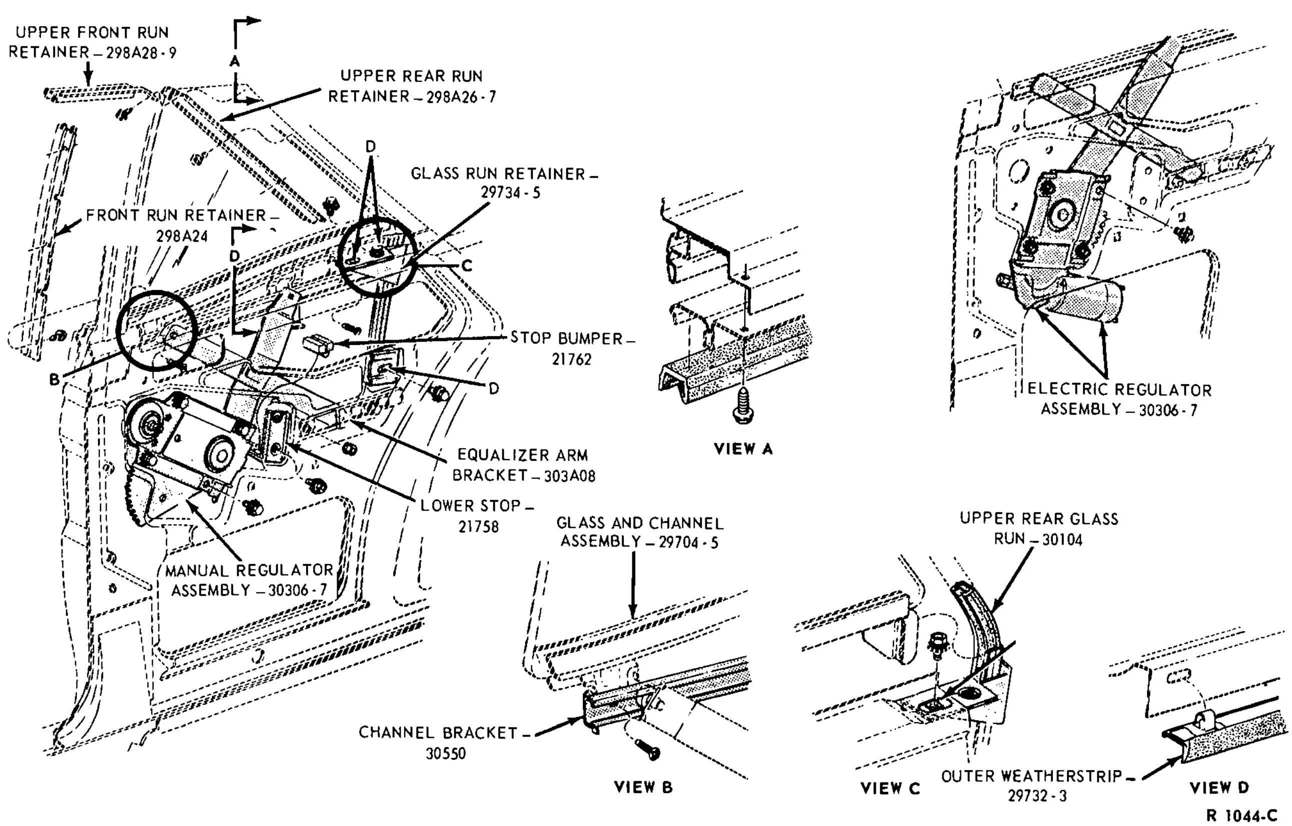


FIG. 7—Quarter Window Mechanism—Falcon, Mercury Intermediate, Fairlane—Model 62

ment, tighten the screw and washer assemblies U securely.

4. Install the watershield and trim panel on the door.

DOOR GLASS ADJUSTMENT—MUSTANG AND COUGAR

1. Remove the door trim panel and watershield.
2. Loosen screws A, B, C, D, F, and G (Fig. 5) and lock nuts E, L, and M (Fig. 5).
3. Raise the window and position the window inboard or outboard for proper alignment with the outside belt weatherstrip. Then, tighten the screw A, Fig. 5.
4. Tilt the window fore or aft to obtain a parallel relationship between the top of the window and the roof rail weatherstrip. Then, tighten the rear guide lock nut (Item E, Fig. 5).
5. Adjust the upper front and rear stops up and down for correct adjustment. Then, tighten the attaching screws (Items F and G, Fig. 5).
6. Position the vent window and division bar run rearward toward the door glass. Then, tilt the vent window fore and aft as necessary to obtain a parallel relationship to the windshield A post. When the parallel relationship is obtained, tighten the vent window attaching screws (Items B and C, Fig. 5). **The door glass must be free of binding after the vent window is adjusted.**
7. Adjust the inboard or outboard tilt of the vent window and door glass to obtain an air tight interference between the windows and the roof rail weatherstrip by adjusting the three set screws (Items H, J, and K, Fig. 5) in or out as required. When the desired adjustment is obtained, tighten the set screw lock nuts (Items E, L, and M, Fig. 5) and the rear guide adjusting screw (Item D, Fig. 5).
8. Install the watershield and trim panel on the door.

REAR DOOR GLASS ADJUSTMENT—FALCON, FAIRLANE AND MERCURY INTERMEDIATE

1. Remove the door trim panel and watershield.
2. To obtain proper alignment of retainer and division bar assembly to door- window frame, loosen nut and washer assembly C. Drop the glass and channel assembly to its down position and turn screw B clockwise or counterclockwise as required. Tighten nut and washer assembly C securely (Fig. 6).
3. Install the watershield and door trim panel.

QUARTER WINDOW ADJUSTMENT—FALCON, FAIRLANE AND MERCURY INTERMEDIATE—MODEL 62

1. Remove the quarter trim panel and watershield.
2. To obtain proper clearance between the quarter window assembly and the quarter window glass run retainer assembly, operate the window to its full down position, loosen screw and washer assembly D, and adjust the retainer assembly forward. After adjustment, tighten the screw and washer assembly finger tight (Fig. 7).
3. To obtain proper clearance between the quarter window assembly and the quarter window glass run retainer assembly, operate the window to its full up position. Loosen screw and washer assemblies D and adjust the retainer assembly forward. After adjustment, tighten screw and washer assemblies D securely.
4. Install the watershield and quarter trim panel.

QUARTER WINDOW ADJUSTMENT—FAIRLANE AND MERCURY INTERMEDIATE—MODEL 63

1. Remove the quarter trim panel

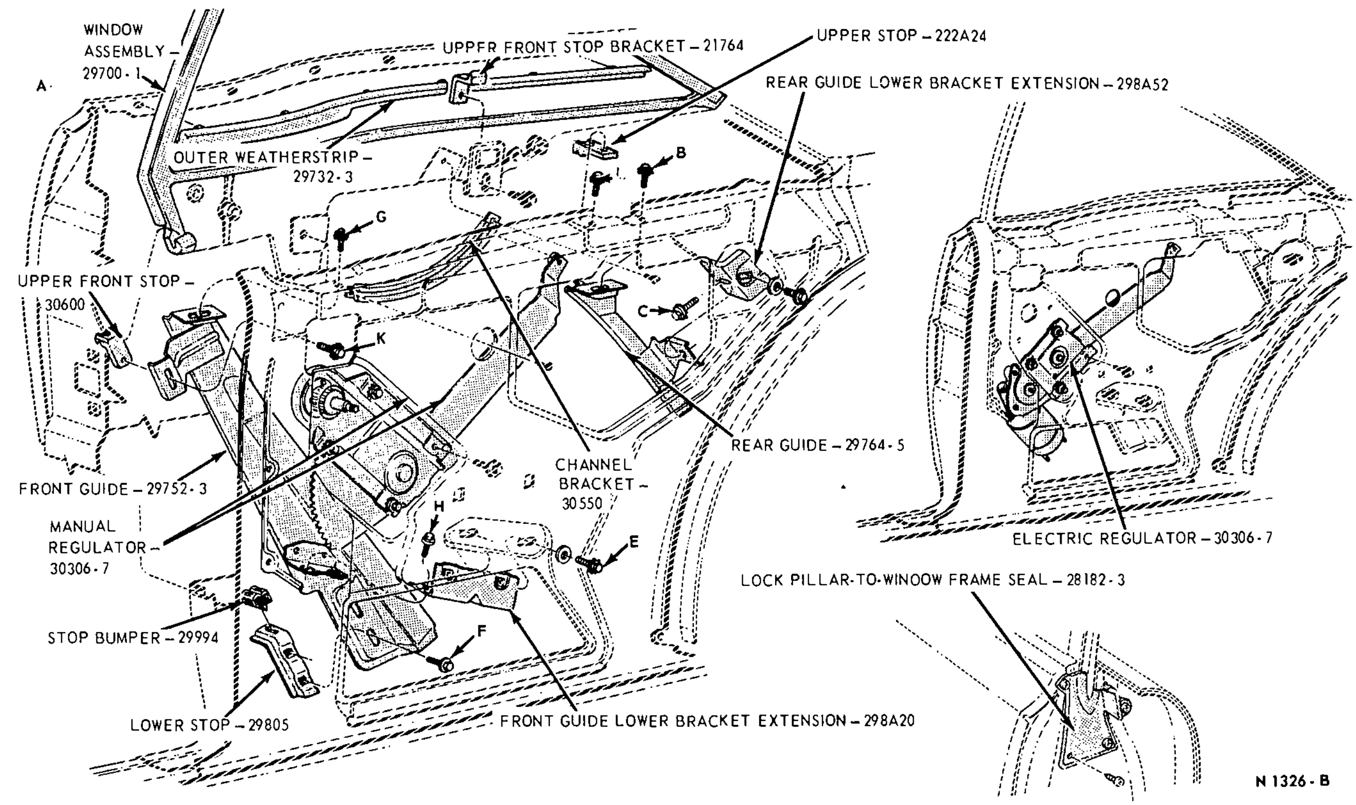


FIG. 8—Quarter Window Mechanism—Fairlane and Mercury Intermediate—Model 63

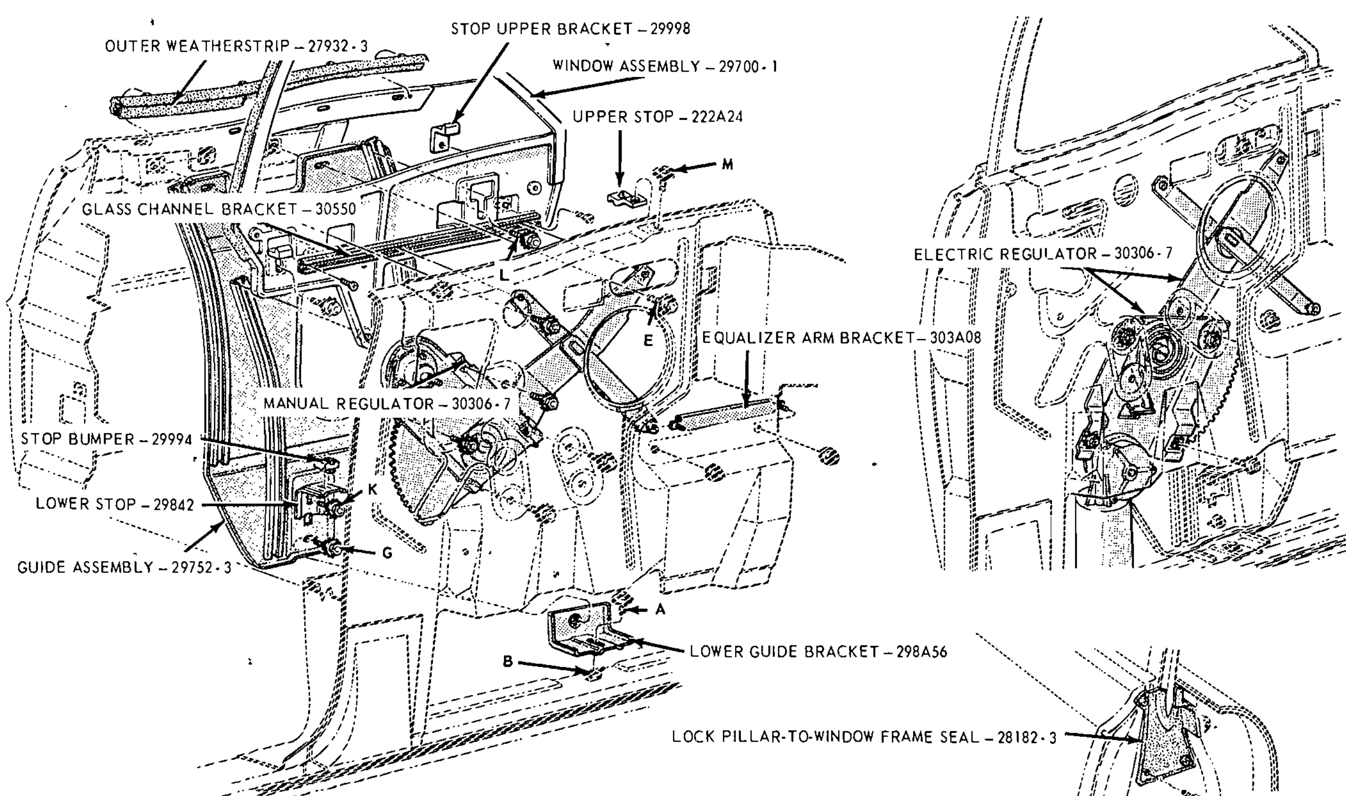


FIG. 9—Quarter Window Mechanism—Fairlane and Mercury Intermediate —Model 76

and watershield to provide access. Refer to Fig. 8 for the following procedure.

2. Temporarily loosen screw and washer assemblies A, B, C, E, F, G, H, K, and L (Fig. 8).

3. It is necessary to obtain a 0.26 to 0.30 inch parallel dimension between the front edge of the quarter window frame and the rear edge of the door window frame as shown in view B, the 0.26 inch parallel dimension as shown in view C, and maintain height relationship of the quarter window to the door window frame and roof rail weatherstrip. To do this, set the quarter window assembly into position and temporarily secure the front guide assembly and the rear guide assembly, by tightening screw and washer assemblies G and B finger tight. Also secure the upper stop assemblies and the door window stop bracket, by tightening the screw and washer assemblies K, L and M securely. The extension assembly, quarter window front guide lower bracket, is secured by tightening screw and washer assemblies E.

4. To obtain proper alignment of the quarter window assembly with the door window glass and channel assembly and proper interference with the roof rail weatherstrip, tilt the front guide assembly inboard or outboard at the bottom as required. When adjustment is complete, tighten screw and washer assemblies H securely.

5. Cycle the quarter window assembly to its down position, flush with the top of the quarter panel. This will locate the rear guide assembly and quarter window rear guide lower extension assembly in its proper position.

6. Tighten screw and washer assemblies A and C securely. Position the quarter window lower stop assembly firmly against the bottom edge of the quarter window assembly and tighten screw and washer assemblies F securely.

7. Cycle the quarter window assembly to its down position and secure the front and rear guide assemblies by tightening screw and washer assemblies B and G securely.

8. Install the watershield and quarter trim panel.

QUARTER WINDOW ADJUSTMENT—FAIRLANE AND MERCURY INTERMEDIATE—MODEL 76

1. Remove the quarter trim panel and watershield.

2. Loosen the screw and washer assemblies A, B, E, G, K, L and M (Fig. 9).

3. Position the window fore and aft and tilt it fore and aft as required for alignment to the front door window and roof rail. This will properly position the quarter window guide panel assembly. Tighten screw and washer assemblies E securely.

4. Position the upper stop assemblies (Fig. 9) and the quarter upper stop brackets and tighten the retaining screw and washer assemblies L and M.

5. Secure the window guide lower bracket to the guide assembly by tightening screw and washer assembly G.

6. To provide alignment with the front door window and an interference fit with the roof rail weatherstrip, tilt the guide assembly inboard or outboard as required. Tighten screw and washer assemblies A and B.

7. Cycle the window to its down position so that the top of the window is flush with the belt line. Position the lower stop assembly against the window channel and tighten the lower stop assembly retaining screw K (Fig. 9).

8. Cycle the window up and down to recheck alignment. Then, install the watershield and quarter trim panel.

QUARTER WINDOW ADJUSTMENT—MUSTANG AND COUGAR

1. Remove the rear seat cushion and seat back.

2. Remove the quarter trim panel and watershield.

3. Loosen the screws (items A, B and C, Fig. 10) before adjusting the quarter window.

4. Adjust the quarter window

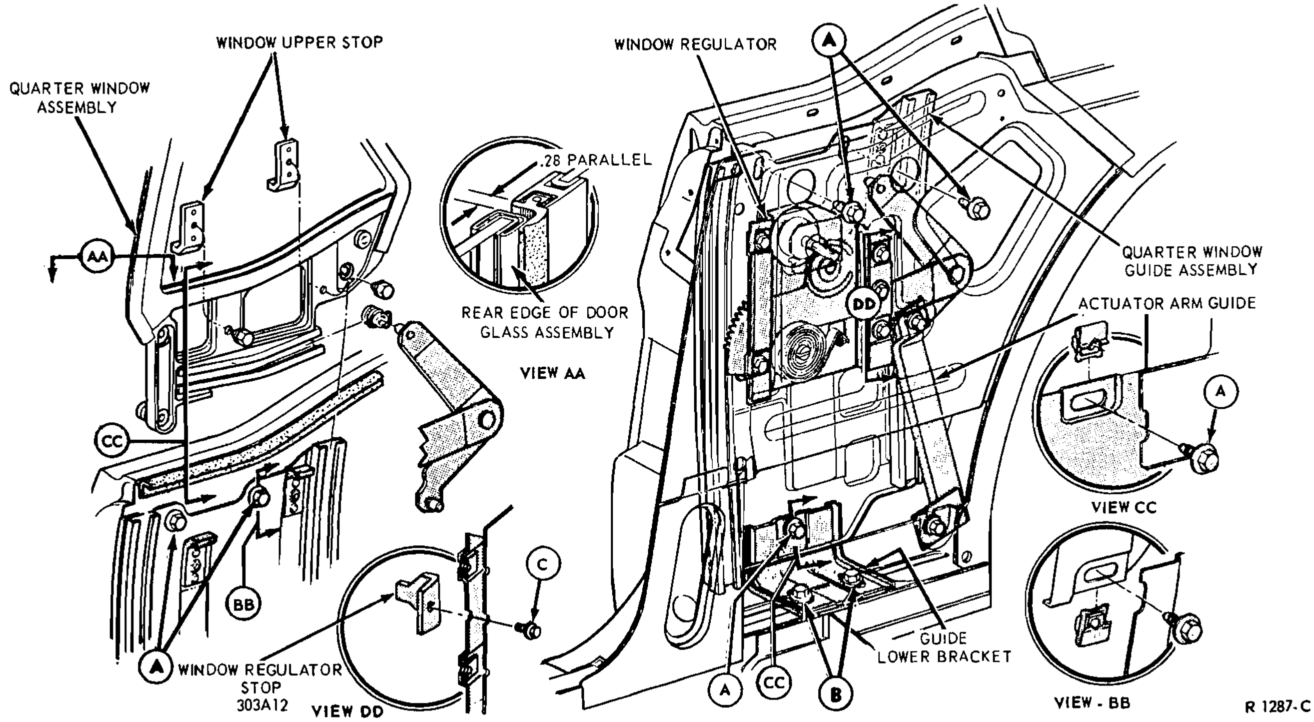


FIG. 10—Quarter Window Adjustment—Mustang and Cougar

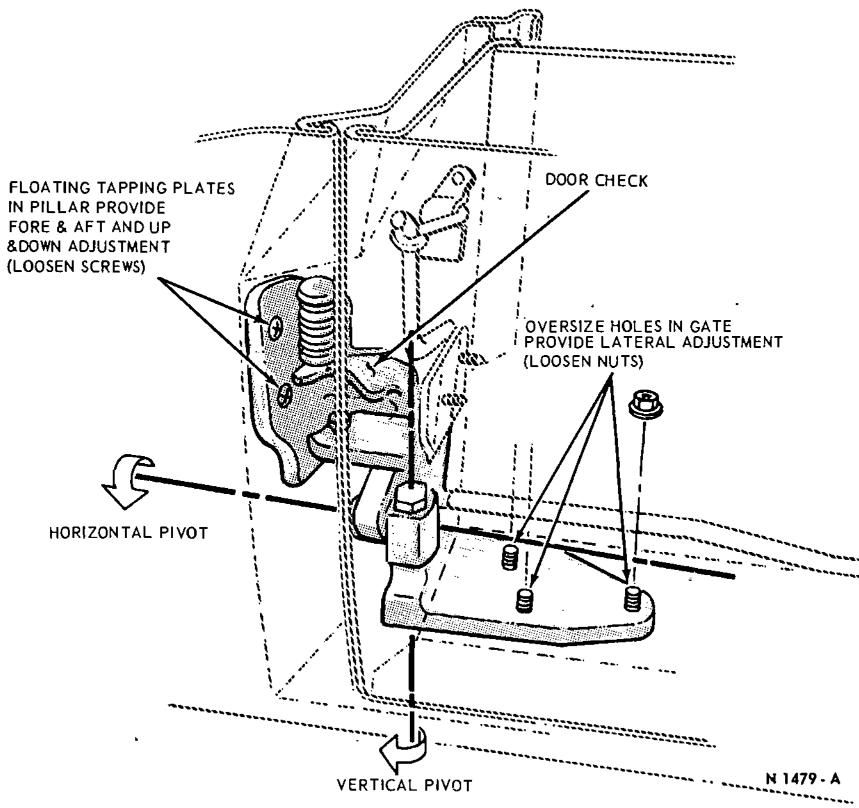


FIG. 11—Lower Left Hinge Assembly

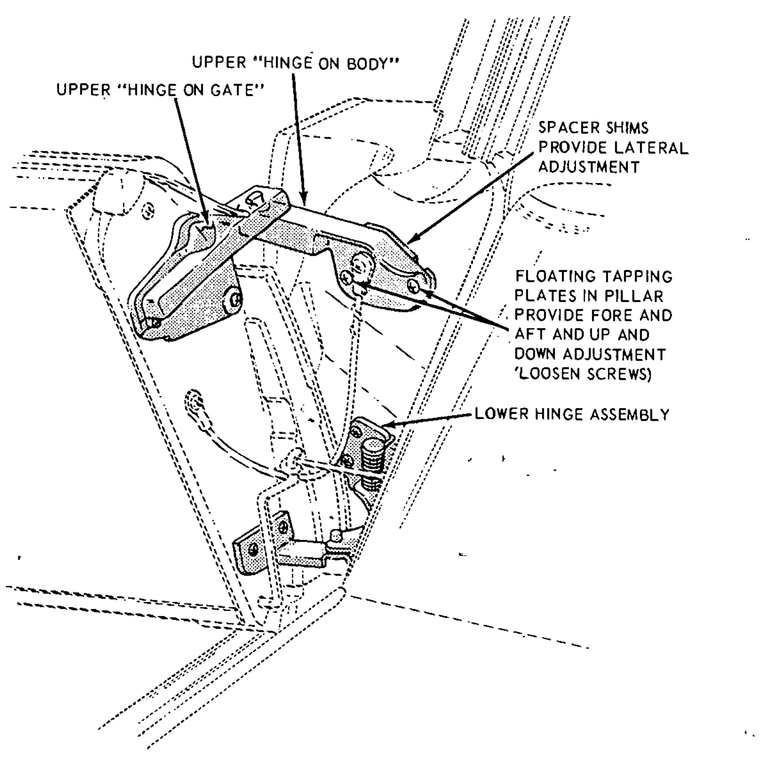


FIG. 12—Upper Left Hinge Assembly

guide forward or backward and up or down at screws (A, Fig. 10) to obtain a 0.28 inch parallel dimension between the front edge of the quarter window and the rear edge of the door window, (View AA Fig. 10). After adjustment, tighten the screws, item A, finger tight.

5. Adjust the top edge of the quarter window for an interference fit with the roof rail weatherstrip by tilting the guide toward the inside or outside of the body. This can be accomplished by loosening screws, items A and B (Fig. 10), and moving the quarter window guide inboard or outboard as necessary. Then, tighten the screws, items A and B.

6. With the quarter window raised to the full up position, turn the regulator handle an additional 1/8 inch. Then, adjust the window regulator stop (Fig. 10) to contact the arm of the regulator and tighten the attaching screw (item C, Fig. 10).

7. Install the quarter weathersheet and trim panel, and the rear seat back and cushion.

DUAL-ACTION TAILGATE ADJUSTMENTS

While full adjustments are provided for the dual action tailgate, no unique methods are employed. The following information will assist in locating and performing the adjustments.

The fore and aft and up and down adjustment of the tailgate is accomplished at the hinge side by means of square holes in the body pillar, backed by floating tapping plates, at the upper and lower hinge attachments (Fig. 11 and 12).

Lateral adjustment of the tailgate is accomplished at the upper hinge by adding or removing spacer shims between the hinge on the body and the pillar. Lateral adjustment at the lower hinge is accomplished by means of oversize holes in the tailgate at the hinge on the gate attachment (Figs. 11 and 12).

Fore and aft and up and down adjustment of the strikers is accomplished by means of square holes in the pillar backed by floating tapping plates. Lateral adjustment is accomplished by adding or removing shims (Fig. 13).

STANDARD TAILGATE HINGE ADJUSTMENT

The tailgate can be adjusted fore or aft and up or down at the hinge to body mounting bolts.

To adjust the tailgate from side to side in the tailgate opening, re-

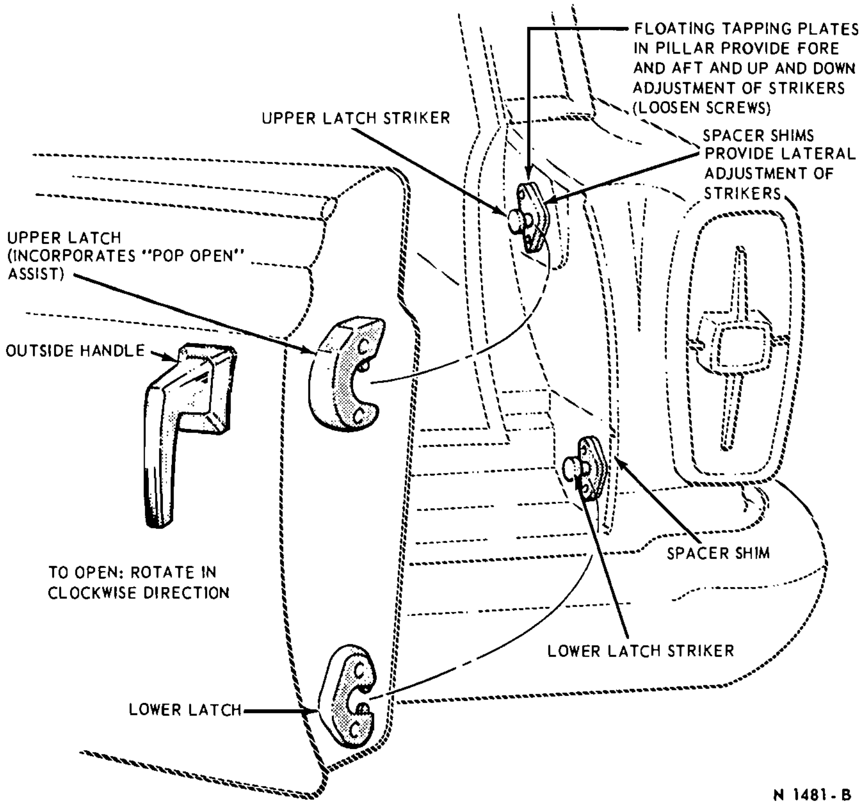


FIG. 13—Tailgate Lock Striker Adjustment

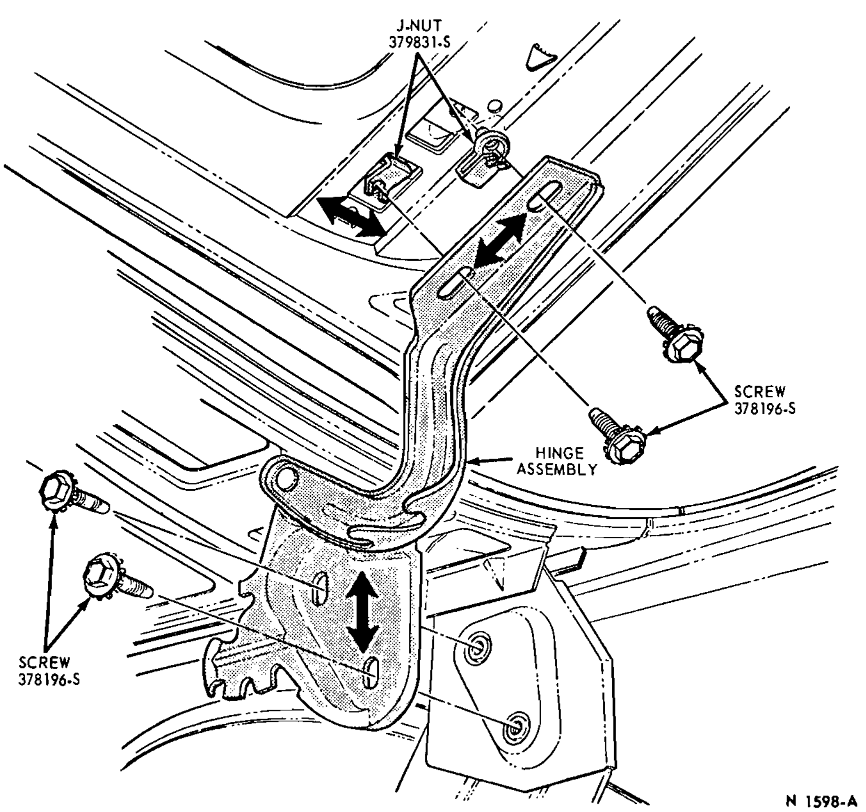


FIG. 14—Luggage Compartment Door Alignment — Mustang and Cougar-Typical

move the trim panel, loosen the hinge to tailgate bolts and shift the tailgate as required.

LUGGAGE COMPARTMENT DOOR LATCH ADJUSTMENT

The striker plate can be adjusted laterally and vertically and the latch can be adjusted laterally. **Before** adjusting the deck lid latch, make sure that the deck lid is properly aligned. To adjust the latch, loosen the attaching screws, move the latch as required to make good contact and tighten the attaching screws. Move the striker plate up or down as necessary to increase or decrease the clearance between the deck lid and the lower back panel.

LUGGAGE COMPARTMENT DOOR ALIGNMENT

The luggage compartment door (deck lid) can be shifted fore and aft and from side to side by loosening the hinge to door attaching screws (Figs. 14 and 15). The up and down adjustment is obtained by adding or removing shims between the hinge and the door (Fig. 15). **On Mustang and Cougar Models,** the up and down adjustment is obtained by loosening the hinge to hinge support attaching screws and raising or lowering the hinge (Fig. 14).

The luggage compartment door should be adjusted for an even and parallel fit with the door opening. The door should also be adjusted up and down for a flush fit with the surrounding panels. Care should be taken not to distort or mar the luggage compartment door or surrounding body panels.

LUGGAGE COMPARTMENT DOOR HINGE TORSION BAR ADJUSTMENT

1. Open the luggage compartment door and note the pop-up distance of the door. The door should pop open about 3 inches and should stay in any raised position.

2. If the door does not pop open to about 3 inches and will not remain open in any position, the torsion bars tension should be increased.

3. If the door pops open more than about 3 inches and will not remain in any open position except full open, the torsion bar tension should be decreased.

4. To adjust the torsion bar tension on a Mustang or Cougar, slip Tool T64K-44890-B over the end of the torsion bar as shown in Fig. 16. Then, rotate the bar rearward

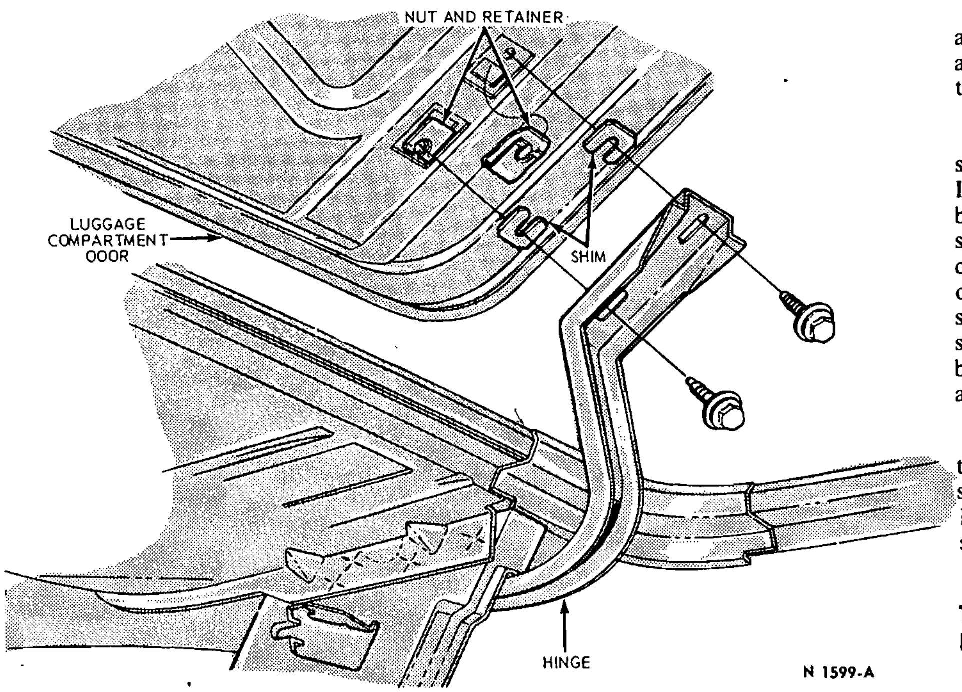


FIG. 15—Luggage Compartment Door Alignment — Falcon, Fairlane, and Mercury Intermediate — Typical

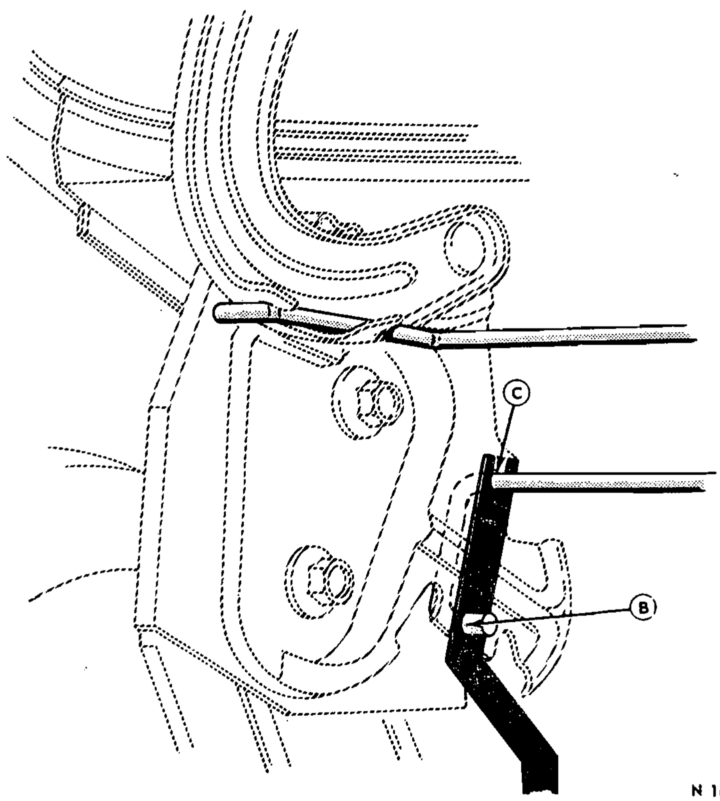


FIG. 16—Torsion Bar Adjustment — Mustang and Cougar — Typical

at point C and re-position point B in another slot to increase or decrease the torsion bar tension, as necessary.

5. To adjust the torsion bar tension on Falcon, Fairlane or Mercury Intermediate models, grip the torsion bar with a pipe wrench at point A shown in Fig. 17. Then, lift the end of the pipe wrench to rotate the bar out of the slot at point B into another slot to increase or decrease the torsion bar tension, as desired. It may be necessary to force the bar down at point C after adjustment.

6. After torsion bar adjustment, the difference of the position of the torsion bar ends between the right and left side must not be more than one slot.

TAILGATE GLASS EMERGENCY LOWERING PROCEDURE

If the tailgate window regulator mechanism should fail with the window in a partially closed or closed position, the following procedure should be used to lower the window.

1. Remove the tailgate inside cover panel attaching screws.

2. Remove the two glass opening side garnish mouldings.

3. Remove one plug button from each side of the tailgate (Fig. 18).

4. Insert two wire hooks in the plug button holes and slide the inner panel up and off the tailgate.

5. Remove the water shield from the tailgate.

6. Remove the four nuts and washers attaching the regulator arm brackets to the glass channel. Hold the glass and disengage the regulator arm brackets from the glass channel and regulator rollers. Then, carefully lower the glass into the tailgate.

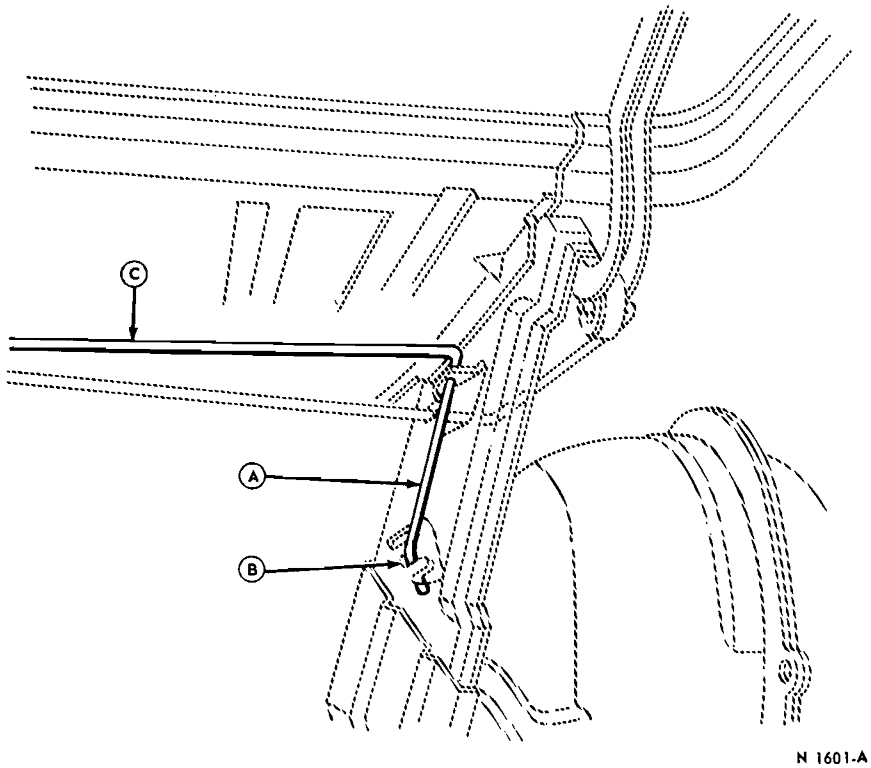


FIG. 17—Torsion Bar Adjustment —Falcon, Fairlane and Mercury Intermediate — Typical

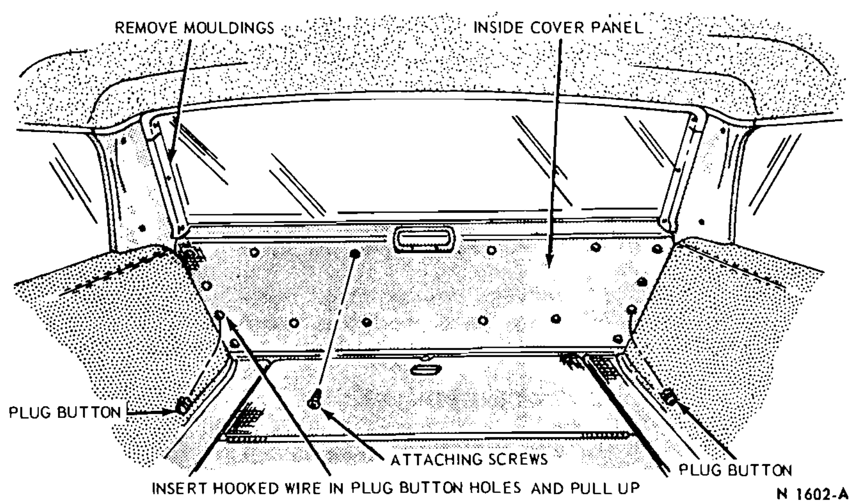


FIG. 18—Tailgate Emergency Opening — Typical

2 REMOVAL AND INSTALLATION

DOORS

REMOVAL

1. Remove the door hinge-to-door attaching bolts, and remove the door.
2. If a hinge is damaged, remove the pillar attaching bolts and remove the hinge.
3. If the door is damaged, a replacement door is furnished as a sheet metal shell in prime paint. It has no hinges, trim, glass, runs, or hardware. When a door is replaced, make any needed minor repairs to the new shell, drill holes necessary for mouldings, paint the door, and transfer all usable parts. Cement the weatherstrip properly.

If only a door outer panel is seriously damaged, the whole door need not be replaced. A replacement outer panel is available.

INSTALLATION

1. If the hinge was removed, install it on the pillar.
2. Position the door to the hinges. Partially tighten the bolts, align the door, and tighten the bolts securely.
3. Align the door glass, glass runs, stops, regulator, and remote control.
4. Install the door water shield and the door trim.

FRONT DOOR LATCH—EXCEPT MODELS 63, 76

REMOVAL

1. Remove the trim panel and position the water shield away from the access holes.
2. Disconnect the door lock remote control link, the latch actuating rod and the lock control to cylinder at the latch (Fig. 19). Remove the knob from the push button rod.
3. Remove the glass rear run lower retaining bolt and position the run away from the door latch.
4. Remove the latch assembly from the door. Remove the push button rod from the latch.

INSTALLATION

1. Connect the push button rod to the latch.
2. Position the latch in the door, and install the retaining screws. Connect the latch control to cylinder rod, the latch actuating rod, and the remote control link at the latch. Install the push button. Be sure to maintain the dimension shown in Fig. 19.
3. Position the glass rear run in the door. Install the retaining bolt, adjust the rear run, and tighten the retaining bolt.
4. Check the operation of the latch. If necessary, adjust the latch striker.
5. Carefully position the water shield to the inner panel, and install the trim panel.

FRONT DOOR LATCH MODELS 63, 76

REMOVAL

1. Remove the door trim panel and watershield.
2. Remove the door window glass channel bracket retaining screws. Prop the window in its up position and cycle the regulator arms to the down position.
3. Disconnect the control rods from the latch assembly (Fig. 19).
4. Remove the three screws retaining the latch assembly and remove the latch assembly from the door.

INSTALLATION

1. Position the latch assembly in the door and install the three latch assembly-to-door retaining screws.
2. Connect the control rods to the latch assembly. Be sure to maintain the dimension shown in Fig. 19.
3. Raise the window regulator arms and bracket and install the regulator arm bracket-to-window chanel retaining screws. Remove the prop used to temporarily hold the window in its up position.
4. Install the door watershield and the trim panel.

REAR DOOR LATCH

REMOVAL

1. Remove the trim panel and position the water shield away from the access holes.
2. Disconnect the door latch remote control rod and door lock control rod at the door latch assembly.
3. Remove the three screws retaining the latch assembly to the door and remove the latch assembly from the door (Fig. 19).

INSTALLATION

1. Position the latch assembly in the door, and install the retaining-ing screws.
2. Connect the door latch remote control rod and the door lock control rod at the door latch assembly.
3. Check the operation of the latch. If necessary, adjust the latch striker.
4. Carefully position the water shield to the inner panel, and install the trim panel.

DOOR LOCK CYLINDER

The key code is stamped on the lock cylinder to assist in replacing lost keys.

When a lock cylinder is replaced, both door lock cylinders and the ignition lock cylinder should be replaced in a set. This will avoid carrying an extra key which will fit only one lock.

1. Remove the trim panel and position the water shield away from the access holes.
2. Disconnect the lock control to door lock cylinder rod at the lock cylinder.
3. Pull the door lock cylinder retainer rearward to release the cylinder, and remove the lock cylinder from the door.
4. Transfer the lock cylinder arm to the new lock cylinder.
5. Position the lock cylinder in the door, and install the lock cylinder retainer (Fig. 19).
6. Connect the lock control to door lock cylinder rod at the lock cylinder.
7. **Carefully position the water shield to the inner panel and install the trim panel.**

DOOR HANDLE AND/OR PUSH BUTTON

1. Remove the door trim panel, and position the water shield away from the access holes.
2. Remove the handle retaining screw and nut, and remove the handle (Fig. 19). To remove the front door handle, it will be necessary to disconnect the latch actuating link.
3. To replace the push button remove the retaining plate screw, retaining plate, spring, push button, and rubber seal from the handle.
4. Install the push button assembly if it was removed, and install the handle assembly. Connect the latch actuating link to the door handle.
5. Carefully position the water shield to the inner panel, and install the trim panel.

DOOR VENT WINDOW FRAME—EXCEPT MODELS 63, 76

REMOVAL

1. Remove the door trim panel, trim panel lower retainer and the watershield.
2. Remove the inner and outer door belt line weatherstrips (view D, Fig. 4) by prying them loose from the door.
3. Remove the window lower stop and completely lower the door window.
4. Remove the front glass run adjusting bolt, lock nut and washer.
5. Remove the front glass run from the division bar retainer at the vent frame by sliding the run down and removing it from the door through the inner panel access hole.
6. Remove the three screws retaining vent frame to the door frame. Remove the vent window assembly and place it on a bench.
7. Remove the screws retaining the upper vent pivot to the vent frame assembly. Remove the nut

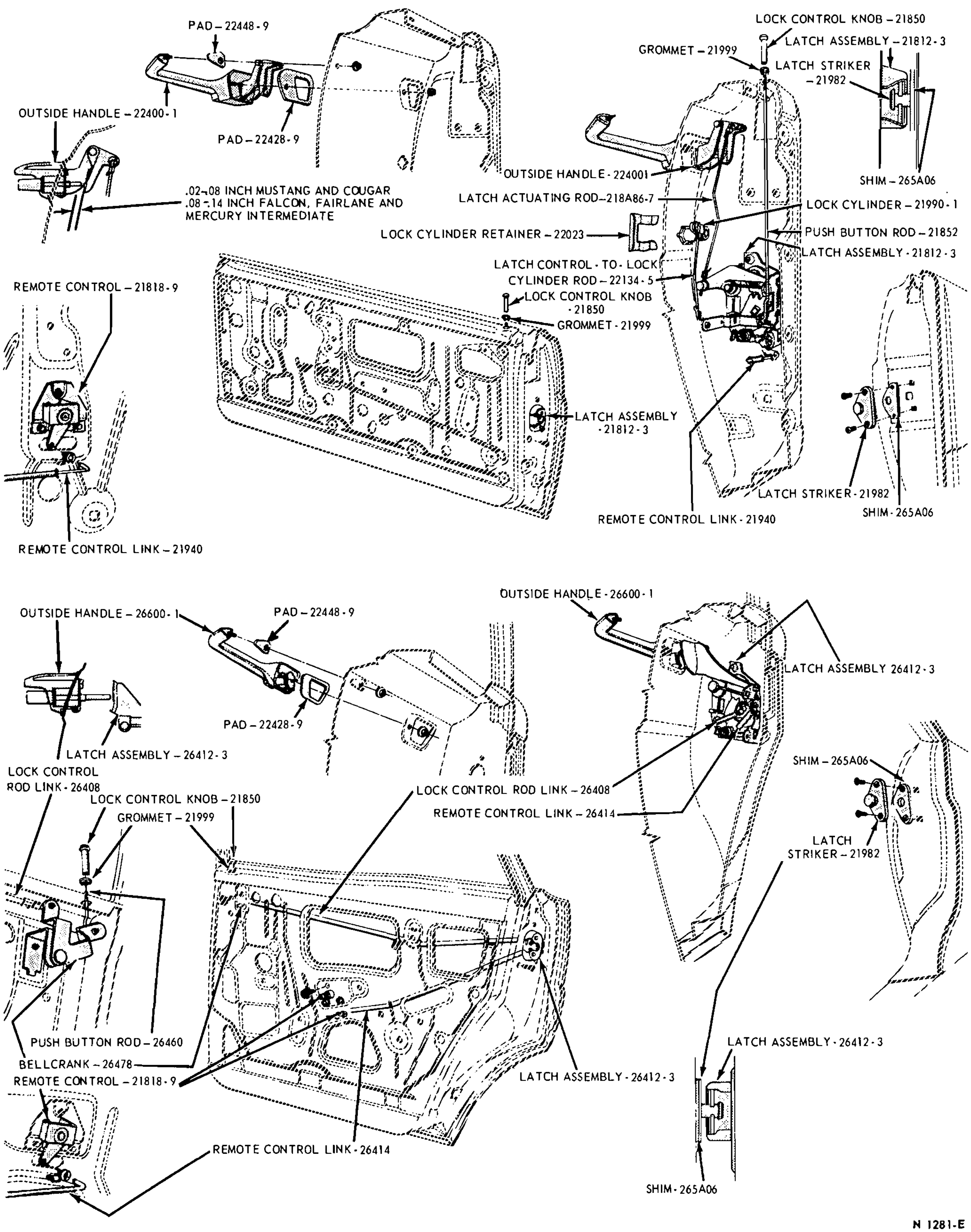


FIG. 19—Door Handle and Latch Installation—Typical

retaining the lower pivot bolt and remove the spring nylon bushings, washer and stop washer.

8. Remove two screws from the top of the assembly and remove the four rivets retaining the vent frame and division bar weatherstrip. Separate the frame and division bar.

9. Using a tool such as shown in Fig. 20, remove the glass. Remove the weatherseal.

INSTALLATION

1. Position new weatherseal to the vent glass.

2. Lubricate the weatherseal with Ru-Glyde and seat the glass assembly in its channel.

3. Position the division bar to the vent frame. Position the vent frame and division bar weatherstrip and install the four rivets and two screws at the top of the frame.

4. Assemble the vent tension spring to the lower pivot and adjust the pivot spring tension so that the window will stay open at highway speeds.

5. Position the frame assembly on the door and install the three retaining screws.

6. Position the glass front run in the door and slide it into the vent frame retainer.

7. Loosely install the front run adjusting bolt and nut.

8. Raise the window halfway and loosely install the lower glass stop.

9. Adjust the front run and tighten the retaining nut.

10. Lower the window so that the top of the glass is level with the window opening belt line.

11. Install the belt line weatherstrips.

12. Install the door watershield and trim panel.

VENT WINDOW FRAME—MUSTANG AND COUGAR

REMOVAL

1. Remove the trim panel and watershield from the door.

GLASS AND CHANNEL REMOVAL TOOL (NO. 2900) AVAILABLE FROM SOMMER AND MALA GLASS MACHINE COMPANY, 5501 W. OGDEN AVENUE, CHICAGO 50, ILLINOIS

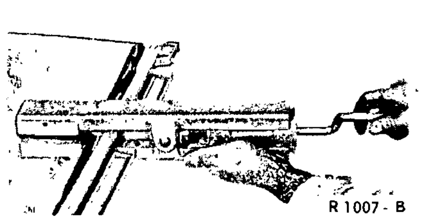


FIG. 20—Glass Channel Replacement

2. Remove two vent window retaining screws (Items B and C, Fig. 5).

3. Remove two lock nuts and set screws (Items J, K, L, and M, Fig. 5) attaching the vent window and front run to the door inner panel.

4. Lift the vent window and front run from the door.

5. Remove the tension nut and spring from the vent window pivot.

6. Remove the vent window tension bracket and remove the vent window from the frame.

INSTALLATION

1. Position the vent window to the frame and install the tension bracket, spring, and nut.

2. Position the vent window and front run in the door and install the two adjusting set screws (Items J and K, Fig. 5).

3. Install the two vent window retaining screws and the set screw lock nuts (Fig. 5).

4. Adjust the vent window as outlined in Section 1.

5. Install the watershield and trim panel on the door.

VENT WINDOW GLASS—MUSTANG AND COUGAR

1. Open the vent window and remove the glass from the vent window frame with the tool shown in Fig. 20.

2. Clean the window frame and apply sealer to the frame.

3. Install the glass and new tape in the window frame with the tool shown in Fig. 20.

4. Trim excess tape around the frame and close the vent window.

VENT WINDOW OR WEATHERSTRIP—MODELS 63, 76

REMOVAL

The vent window glass may be removed and/or installed by using the tool shown in Fig. 20. When installing new glass, use new glass tape, and apply sealer to the frame horizontal channel and to the other channel in the area of the upper pivot.

1. Remove the door trim panel and position the water shield away from the access holes.

2. Remove the front run bracket retaining bolt, and position the run out of the vent window division bar (Fig. 2).

3. Remove the door vent window assembly retaining bolts and retaining nut, and remove the vent window assembly.

4. Remove the upper pivot from the frame and remove the lower pivot spring assembly, then remove the vent window and frame.

5. Remove the weatherstrip.

INSTALLATION

1. Install the weatherstrip.

2. Position the vent window and frame into the vent assembly.

3. Install the pivot and the pivot spring assembly. Adjust the spring tension so that the vent glass will stay open when the car is driven at highway speeds.

4. Position the vent window assembly in the door and install the retaining bolts and retaining nut snugly.

5. Position the front run in the vent window division bar and install the retaining bolt snugly.

6. Align the vent window and front run and tighten the retaining bolts and retaining nut.

7. Carefully position the water shield to the inner panel and install the trim panel.

FRONT DOOR GLASS—FALCON, FAIRLANE, AND MERCURY INTERMEDIATE—EXCEPT MODELS 63, 76

REMOVAL

1. Remove the trim panel and position the water shield away from the access holes.

2. After removing the stop (Fig. 4), lower the glass until the regulator arm roller is out of the glass channel.

3. Unsnap and remove the belt weatherstrips, loosen the front run attaching bolt at the mounting bracket, and remove the bracket attaching bolt from the inner panel.

4. Remove the front run from the division bar by pulling rearward on the edges of the run.

5. Remove the glass.

INSTALLATION

1. Using the tool shown in Fig. 20, remove the channel from the glass.

2. Install the channel, using new glass tape.

3. Simultaneously, position the glass and run in the door, and install the belt weatherstrips.

4. Position the regulator arm roller in the channel, and finally position the run in the division bar.

5. Connect the run and bracket, making necessary lateral adjustment.

6. Install the stop, making necessary adjustment.
7. Carefully position the water shield, the inner panel, and install the trim panel.

FRONT DOOR GLASS—MERCURY INTERMEDIATE AND FAIRLANE—MODELS 63, 76

REMOVAL

1. Remove the door trim panel and watershield.
2. Remove the door trim panel upper retainer from the door. This provides access to the window upper stop retaining screws.
3. Remove the window upper stops (Fig. 2).
4. Remove the vent window and division bar retaining screws and nuts (Fig. 2).
5. Remove the rear guide retaining screws and nuts. Remove the rear guide from the door.
6. Remove the glass channel roller brackets from the lower window channel.
7. Lower the window assembly into the door.
8. Remove the door belt inner weatherstrip by unsnapping the weatherstrip retainer clips from the door inner panel.
9. Remove the run assembly from the vent division bar.
10. Remove the vent window assembly from the door.
11. Lift the door glass assembly up and out of the door.
12. Remove the frame from the glass.

INSTALLATION

1. Position the frame on new glass.
2. Position the door glass assembly in the door.
3. Position the vent window assembly in the door.
4. Install the front run assembly in the Vent division bar.
5. Snap the door belt inner weatherstrip and retaining clips into place on the door inner panel.
6. Raise the door glass and install the regulator channel brackets on the lower window frame.
7. Position the rear guide assembly in the door and install, but do not tighten, the retaining nuts and screws snug.
8. Position the window upper stops and install, but do not tighten, the stop retaining screws.
9. Adjust the vent window assembly to the front pillar and tighten the division bar retaining screws and nuts.
10. Adjust the rear guide and tighten the retaining nuts and screws.
11. Adjust the window upper stops and tighten the stop retaining screws.
12. Install the door trim panel upper retainer.
13. Install the door trim panel watershield and the door trim panel.

FRONT DOOR GLASS—MUSTANG AND COUGAR

REMOVAL

1. Remove the trim panel and weathersheet from the door.
2. Remove six screws attaching the lock pillar seal to the door at the belt line and remove the seal.
3. Remove the upper front stop and the upper rear stop bracket from the door (Fig. 5).
4. While holding the glass, remove three screws attaching the channel guide bracket to the glass channel and lower the glass.
5. Loosen the two window rear guide upper attaching screws.
6. Loosen the two vent window upper attaching screws (Fig. 5).
7. Loosen the front run and bracket set screw and the vent window set screw (Fig. 5).
8. Tilt the vent window frame forward and lift the glass and channel from the door.
9. Remove two screws attaching the frame and channel together and remove the frame and channel from the glass (Fig. 20).

INSTALLATION

1. Position the weatherseal tape in the frame and channel and lubricate with Ru-Glyde Lubricant B6A-19583-A.
2. Install the frame and channel on the glass with the tool shown in Fig. 20.
3. Install the two screws to retain the frame and channel together.
4. Position the glass and channel in the door with the front edge of the glass in the front run and the rollers on the channel in the window rear guide.
5. Position the channel guide bracket (Fig. 5) to the glass channel and install the three attaching screws.
6. Loosely install the window upper front stop and the rear upper stop bracket.
7. Align the vent window frame to the windshield pillar and tighten the attaching nuts and set screw locknuts.
8. Adjust the window rear guide for the correct tilt to fit the window and tighten the two attaching bolts and the set screw locknut.
9. Adjust the upper front and rear stops and torque the attaching bolts to 8-13 ft-lb.
10. Position the lock pillar seal to the door and install the six attaching screws.
11. Install the weathersheet and trim panel on the door.

FRONT DOOR WINDOW REGULATOR—MANUAL—MERCURY INTERMEDIATE AND FAIRLANE—MODEL 63, 76

REMOVAL

1. Remove the front door trim panel and watershield.
2. Remove the four regulator assembly retaining screws.
3. Prop the window in its up position and remove the front channel bracket from the window frame.
4. Loosen the front run retaining nut and remove the regulator from the door. The regulator arm rollers will slide out of the rear channel bracket and the equalizer arm bracket to permit removal of the regulator assembly from the door.

INSTALLATION

1. Position the regulator assembly in the door and install the regulator arm rollers in the channel brackets.
2. Align the regulator retaining screw holes with the retaining screw holes in the door panel and install the four regulator assembly retaining screws.
3. Install the front run lower retaining nut.
4. Install the front channel bracket on the window frame.
5. Install the watershield and door trim panel.

FRONT DOOR WINDOW REGULATOR—FALCON, FAIRLANE, AND MERCURY INTERMEDIATE —EXCEPT MODELS 63, 76

REMOVAL

1. Remove the trim panel and position the water shield away from the access holes.
2. Disconnect the regulator from the glass channel roller.
3. Raise the glass by hand and secure it in the raised position.
4. Remove the regulator retaining bolts (Fig. 3) and remove the regulator through the door access hole.

INSTALLATION

1. Position the regulator inside the door and install the retaining bolts snugly.
2. Lower the glass and connect the regulator.
3. Check the operation of the glass, adjust it if necessary, and tighten the retaining bolts.
4. Carefully position the water shield to the inner panel and install the trim panel.

FRONT DOOR WINDOW REGULATOR—MUSTANG AND COUGAR

REMOVAL

1. Remove the trim panel and weathersheet from the door.
2. While holding the glass, remove three screws attaching the channel guide bracket (Fig. 5) to the glass channel and prop the glass and channel up.
3. Remove four screws attaching the regulator to the door inner panel and remove the regulator and channel guide bracket from the door.
4. Remove the channel guide bracket from the regulator.

INSTALLATION

1. Lubricate the channel guide bracket and install the bracket on the regulator.
2. Position the regulator to the door inner panel and install the four attaching screws. Torque the screws to 8-13 ft-lb.
3. Position the channel guide bracket to the glass channel and install the three attaching screws. Torque the screws to 15-20 in-lb.
4. Install the weathersheet and trim panel on the door.

FRONT DOOR GLASS REAR RUN—MERCURY INTERMEDIATE AND FAIRLANE—MODELS 63, 76

REMOVAL

1. Remove the trim panel and position the water shield away from the access holes.
2. Remove both window upper stop brackets from the glass lower channel.
3. Disconnect both regulator arms from the glass lower channel, and remove the rollers. Remove the glass assembly.
4. Remove the glass rear run lower retaining bolt. Remove the run upper adjusting screw lock nut. **Do not disturb the position of the adjusting screw.** Remove the run from the door.

INSTALLATION

1. Position the rear run in the door and install the lower retaining bolt and upper adjusting screw lock nut snugly.
2. Position the glass assembly in the door. Install the rollers in the glass lower channel, and connect both regulator arms.
3. Attach the window upper stop brackets to the lower channel.
4. Adjust the rear run and tighten the retaining bolt and nut.
5. Carefully position the water shield to the inner panel and install the trim panel.

FRONT DOOR GLASS REAR RUN—FALCON, FAIRLANE, AND MERCURY INTERMEDIATE—EXCEPT MODELS 63, 76

1. Lower the window and pull the rear run from the door and rear run retainer.
2. Apply Silicon Lube to the new run in the area that is below the belt line.
3. Slide the run into the run retainer below the belt line.
4. Apply adhesive to the run retainer above the belt line and insert the run into the retainer. Then, raise the window to firmly seat the run in the retainer.

FRONT DOOR GLASS REAR GUIDE—MUSTANG AND COUGAR

REMOVAL

1. Remove the trim panel and weathersheet from the door.
2. Remove the upper rear stop (Fig. 5) from the glass channel.
3. Remove the upper rear stop from the rear guide (Fig. 5).
4. Remove the two rear guide to door attaching bolts.
5. Remove the lock nut from the rear guide set screw and remove the set screw.
6. Remove the rear guide from the door through the opening at the bottom of the door.

INSTALLATION

1. Lubricate the rear guide and install the set screw in the guide.
2. Position the rear guide to the door and the rollers on the glass channel.
3. Install the two rear guide attaching screws.
4. Install the lock nut on the rear guide set screw.
5. Install the upper rear stop on the rear guide (Fig. 5).
6. Adjust the rear guide and tighten the two attaching screws and lock nut. Adjust the window upper rear stop.
7. Install the weathersheet and trim panel on the door.

REAR DOOR GLASS—MODELS 54, 71

REMOVAL

1. Remove the door trim panel and watershield.
2. Remove the two screws retaining the regulator roller channel bracket to the lower window channel (Fig. 3).
3. Remove the lower stop assembly.
4. Remove the screw and nut retaining the rear run retainer and stationary glass. Move the run retainer and glass back and down in the door.
5. Remove the door belt, outside weatherstrip.
6. Tilt the door window down and then lift it out of the door.
7. Using a tool such as shown in Fig. 20, remove the glass from the lower channel.

INSTALLATION

1. Position new glass tape on the glass and, using a tool such as shown in Fig. 20, install the lower channel on the glass.
2. Position the glass and channel assembly in the door.
3. Position the rear run retainer and stationary glass assembly and install the retainer screw and nut.
4. Install the regulator roller channel bracket on the window channel.
5. Install the lower window stop.
6. Install the door trim watershield and the door trim panel.
7. Install the window outside belt weatherstrip.

REAR DOOR WINDOW REGULATOR

REMOVAL

1. Remove the trim panel and position the water shield away from the access holes.
2. Disconnect the regulator from the glass channel roller.
3. Raise the glass by hand and

secure it in the raised position.

4. Remove the regulator retaining screws and remove the regulator through the door access hole.

INSTALLATION

1. Position the regulator inside the door and install the retaining screws snugly.
2. Lower the glass and connect the regulator.
3. Check the operation of the glass, adjust it if necessary, and tighten the retaining bolts.
4. Carefully position the water shield to the inner panel and install the trim panel.

QUARTER WINDOW GLASS—MUSTANG AND COUGAR

REMOVAL

1. Remove the rear seat cushion and seat back from the vehicle.
2. Remove the quarter trim panel from the vehicle.
3. Remove six screws retaining the seal to the lock pillar and remove the seal.
4. Remove both window upper stops from the quarter window assembly (Fig. 10).
5. Remove two quarter window guide upper attaching screws (Fig. 10).
6. Remove one screw attaching the guide lower bracket to the quarter window guide (Fig. 10).
7. Lower the glass and disconnect the roller and regulator arm from the glass channel. Then, remove the quarter window assembly from the vehicle.
8. Remove one screw attaching the front weatherstrip to the glass frame and remove the weatherstrip.
9. Remove four screws retaining the four piece window frame together and remove the frame pieces from the glass with the tool shown in Fig. 20. **One piece of the frame is bonded to the glass and cannot be removed.**

INSTALLATION

1. Clean the glass frame and install the frame and new tape on the glass with the tool shown in Fig. 20. Then, install the four frame retaining screws and trim off any excess tape.
2. Position the front weatherstrip to the glass frame and install the attaching screw.
3. Position the quarter window assembly into the quarter panel and to the guide assembly.
4. Install the three guide assembly attaching screws snug.
5. Place the clip on the regulator arm roller, and position the roller in the glass channel. Then, connect the roller to the window regulator.
6. Adjust the quarter window as outlined in Section 1 and tighten the guide assembly attaching screws (Fig. 10).
7. Install the window upper stops (Fig. 10) and the lock pillar seal.
8. Install the quarter trim panel and the rear seat back and seat cushion.

QUARTER GLASS—MODEL 62

REMOVAL

1. Remove the rear seat cushion and back.
2. Remove the trim panel and position the water shield away from the access hole.
3. Remove the lower and front garnish moldings.
4. Remove the rear run.
5. Lower the window until the regulator rollers are accessible, and disconnect the front rollers from the channel.
6. Lower and tilt the glass to remove it.

INSTALLATION

1. Transfer the channel, using the tool shown in Fig. 20.
2. Position the glass in the quarter panel, and connect the front rollers.
3. Install the rear run, adjusting it as necessary.
4. Install the garnish mouldings, position the water shield, and install the trim panel.
5. Install the seat cushion and back.

REAR QUARTER WINDOW GLASS—MERCURY INTERMEDIATE AND FAIRLANE—MODEL 76

REMOVAL

1. Remove the rear seat cushion, seat back and quarter trim panel.
2. Remove the quarter window upper stops.
3. Remove the lower glass channel bracket (Fig. 9) from the lower glass channel.
4. Remove the three quarter window guide panel retaining screws.
5. Raise the top assembly off the windshield header far enough to permit clearance between the window and roof side rails.
6. Remove the window from the quarter panel.
7. Remove the retaining screw from the weatherstrip and remove the weatherstrip from the window.
8. Remove the screws retaining the window top frame and remove the frame from the glass.
9. Using a tool such as shown in Fig. 20, remove the glass from the lower and side channel.

INSTALLATION

1. Using a tool such as shown in Fig. 20, install the lower and side channels on the glass.
2. Position the top frame on the glass assembly and install the frame retaining screws.
3. Position the quarter window weatherstrip on the window assembly and install the weatherstrip retaining screw.
4. Position the quarter window in the guide assembly and install the guide retaining screws snugly.
5. Install the lower glass channel bracket on the glass channel.
6. Install the window upper stops snugly.
7. Raise the top assembly and fasten the top hold-down clamps.
8. Align the window assembly to the door glass and top side rails. Adjust the upper and lower window stops and tighten all retaining screws.
9. Cycle the window assembly up and down to insure proper adjustment. Then, install the quarter trim panel, rear seat back and seat cushion.

QUARTER WINDOW GLASS—MERCURY INTERMEDIATE AND FAIRLANE—MODEL 63

REMOVAL

1. Remove the quarter trim panel and watershield.
2. Remove the two upper stops (Fig. 8).
3. Remove the quarter window upper garnish moulding.
4. Remove two screws attaching the glass channel bracket and remove the bracket (Fig. 8).
5. Remove the two rear guide attaching screws and remove the rear guide.
6. Remove three front guide attaching screws and position the guide down in the quarter panel.
7. Tilt the glass rearward and remove it from the vehicle.
8. Remove one screw and remove the weatherstrip from the quarter window.
9. Remove three top frame retaining screws and remove the frame.
10. Remove the glass from the channel with the tool shown in Fig. 20.

INSTALLATION

1. Install the glass in the channel with the tool shown in Fig. 20. Be sure to use new tape around the glass where it fits into the glass channel. Then, trim off the excess tape with a razer blade.
2. Position the top frame on the glass and install the retaining screws.
3. Position the weatherstrip to the quarter window and install the retaining screw.
4. Position the glass in the quarter panel. Then, position the rear guide and install the attaching screws snug.
5. Install the front guide and tighten the attaching screws snug.
6. Position the channel bracket to the regulator arm and glass channel and install the two attaching screws.
7. Install the two upper stops (Fig. 8).
8. Adjust the quarter window as outlined in Section 1 of this Part.
9. Install the upper garnish moulding, watershield, and quarter trim panel.

QUARTER WINDOW REGULATOR—MUSTANG AND COUGAR

REMOVAL

1. Remove the rear seat cushion and seat back from the vehicle.
2. Remove the quarter trim panel from the vehicle.
3. Disconnect the window regulator arm from the roller in the glass channel (Fig. 10) and support the glass in the up position.
4. Remove five screws attaching the window regulator and stop to the quarter inner panel. Then, slide the window regulator arm roller out of the actuator arm guide and remove the window regulator from the quarter panel.
5. Remove the roller from the window regulator arm.

INSTALLATION

1. Install the roller on the window regulator arm.
2. Position the window regulator into the quarter panel and engage the regulator arm roller in the actuator arm guide.
3. Install the four window regulator attaching screws and the window regulator stop and attaching screw.
4. Connect the window regulator arm to the roller in the glass channel and remove the glass support.
5. Install the quarter trim panel and the seat back and seat cushion.

QUARTER WINDOW REGULATOR—MODEL 62

REMOVAL

1. Remove the rear seat cushion and back.
2. Remove the trim panel and position the water shield away from the access hole.
3. Disconnect the regulator from the glass channel rollers.
4. Raise the glass by hand and secure it in the raised position.
5. Remove the regulator retaining bolts, slide the regulator arm out of the equalizer and remove the regulator.

INSTALLATION

1. Position the regulator inside the quarter panel, engage the arm in the equalizer, and install the regulator retaining bolts snugly.
2. Position the rollers in the glass channel, lower the glass and connect the regulator.
3. Check the operation of the glass, adjust it if necessary, and tighten the retaining bolts.
4. Position the water shield, and install the trim panel.
5. Install the seat cushion and back.

QUARTER WINDOW REGULATOR—MERCURY INTERMEDIATE AND FAIRLANE—MODEL 63

REMOVAL

1. Remove the rear seat cushion and seat back.
2. Remove the quarter trim panel and water shield.
3. Remove the screws retaining the glass channel bracket to the lower glass channel and remove the glass channel bracket. Prop the window assembly in its up position.
4. Remove the four screws retaining the regulator assembly to the quarter panel and remove the regulator assembly.

INSTALLATION

1. Position the regulator assembly in the quarter panel and install the four regulator retaining screws.
2. Remove the prop used to hold the window up and install the glass channel bracket on the glass channel.
3. Install the quarter trim panel watershield and trim panel.
4. Install the rear seat back and cushion.

QUARTER WINDOW REGULATOR — MERCURY INTERMEDIATE AND FAIRLANE—MODEL 76

REMOVAL

1. Remove the quarter trim panel and watershield.
2. Remove two screws attaching the channel bracket to the glass channel and remove the channel bracket (Fig. 9).
3. Remove the window lower stop.
4. Remove four window regulator attaching screws and remove the regulator from the quarter panel.

INSTALLATION

1. Position the regulator in the quarter panel and install the four attaching screws.
2. Position the channel bracket to the regulator arm rollers and glass channel. Then, install the two channel bracket attaching screws.
3. Install and adjust the window lower stop.
4. Install the watershield and quarter trim panel.

QUARTER WINDOW FRONT RUN — MODEL 62

REMOVAL

1. Remove the quarter trim panel and watershield.
2. Lower the window and pull the run from the run retainers (Fig. 7).

INSTALLATION

1. Lube the run at the front lower end with silicon and insert the run in the run retainers.
2. Raise the window and install the watershield and quarter trim panel.

QUARTER WINDOW FRONT GUIDE — MERCURY INTERMEDIATE AND FAIRLANE —MODEL 63

REMOVAL

1. Remove the rear seat cushion and seat back.
2. Remove the quarter window handle, arm rest, the quarter trim panel, trim panel retainer, garnish moulding, and position the water shield away from the access hole.
3. Remove the quarter window front guide lower retaining bolts and the adjuster screw lock nut.
4. Turn the adjuster screw to its full in position.

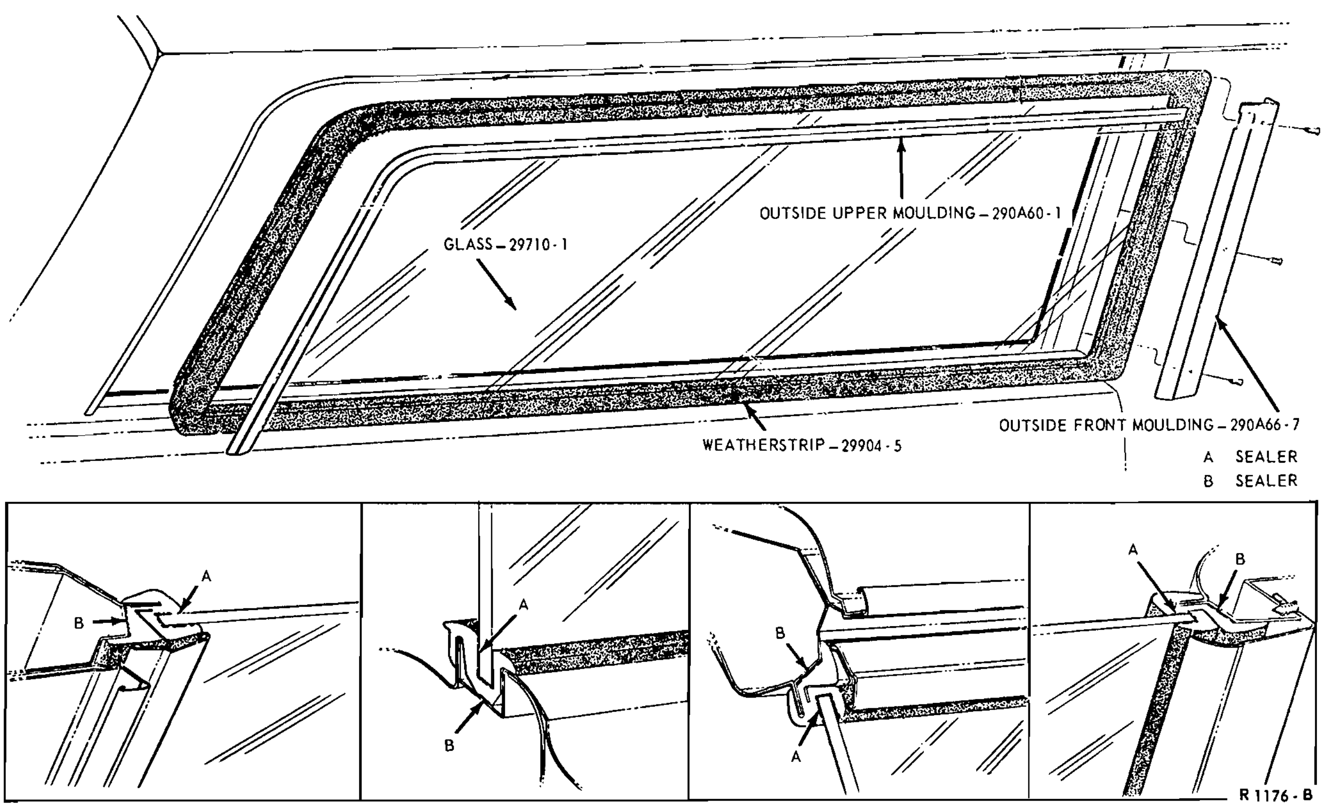


FIG. 21—Stationary Rear Quarter Window—Models 71

5. With the quarter glass in the lowered position remove the quarter window front guide from the glass channel rollers.
6. Remove the quarter window front guide through the access hole with the window glass in the up position.

INSTALLATION

1. With the quarter glass in the up position, install the quarter window front guide into the glass channel rollers.
2. Install the quarter window front guide retaining bolts and adjuster screw lock nut snugly.
3. Check the operation of the glass, adjust it if necessary, and tighten the retaining bolts and adjuster screw lock nut.
4. Position the water shield and install the garnish moulding, trim panel retainer, quarter trim panel, regulator handle, and arm rest.
5. Install the rear seat back and seat cushion.

QUARTER WINDOW REAR GUIDE—MUSTANG AND COUGAR

REMOVAL

1. Remove the quarter trim panel and watershield.
2. Remove the quarter window windlace.
3. Disconnect the regulator arm from the roller in the glass channel (Fig. 10).
4. Remove two quarter window guide upper retaining bolts (items A, Fig. 10).
5. Remove the two window upper stops (Fig. 10) and the window regulator stop. Then, remove the quarter window.
6. Remove one bolt attaching the guide from the quarter panel.

INSTALLATION

1. Position the guide in the quarter panel and install the guide to lower bracket attaching bolt.
2. Position the regulator arm roller in the glass channel and position the glass channel roller down into the guide.
3. Move the window regulator to the up position.
4. Install the two upper stops (Fig. 10).
5. Lower the window regulator and connect the regulator arm to the glass channel roller.

6. Adjust the quarter window as outlined in Section 1 of this Part.

7. Install the quarter window windlace, watershield, and trim panel.

QUARTER WINDOW FRONT GUIDE—MUSTANG AND COUGAR

REMOVAL

1. Remove the rear seat cushion and seat back from the vehicle.
2. Remove the quarter trim panel from the vehicle.
3. Remove six screws retaining the seal to the lock pillar and remove the seal.
4. Remove both window upper stops from the quarter window assembly (Fig. 10).
5. Remove two quarter window guide upper attaching screws, item A (Fig. 10).
6. Remove one screw attaching the guide lower bracket to the quarter window guide (Fig. 10).
7. Lower the glass and disconnect the roller and regulator arm from the glass channel.
8. Remove the quarter window assembly from the vehicle.
9. Remove the quarter window guide assembly from the vehicle.

INSTALLATION

1. Position the quarter window guide assembly in the quarter panel. Then, position the quarter window assembly into the quarter panel and guide assembly.

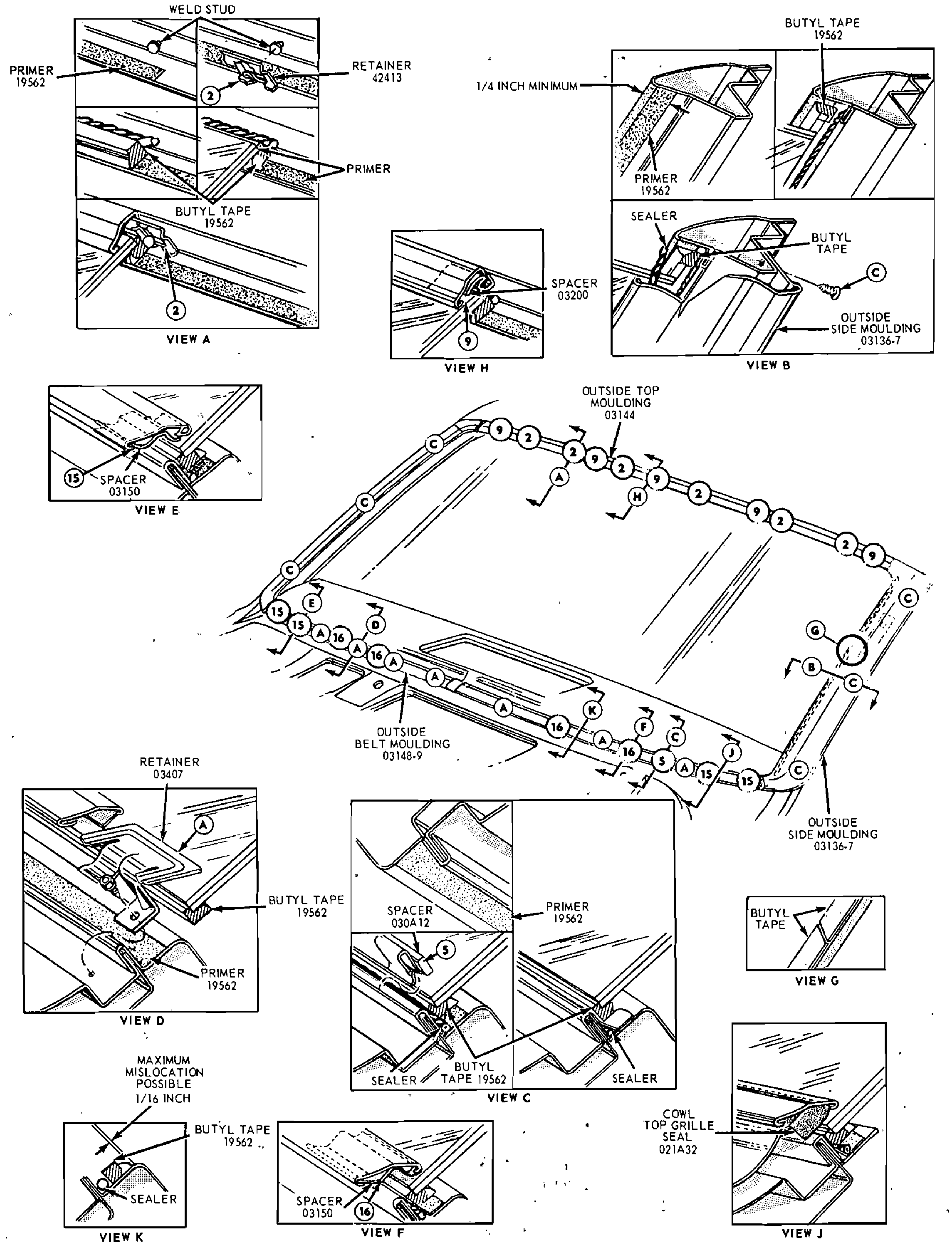


FIG. 22— Windshield and Moulding Installation—Mercury Intermediate, Falcon, and Fairlane

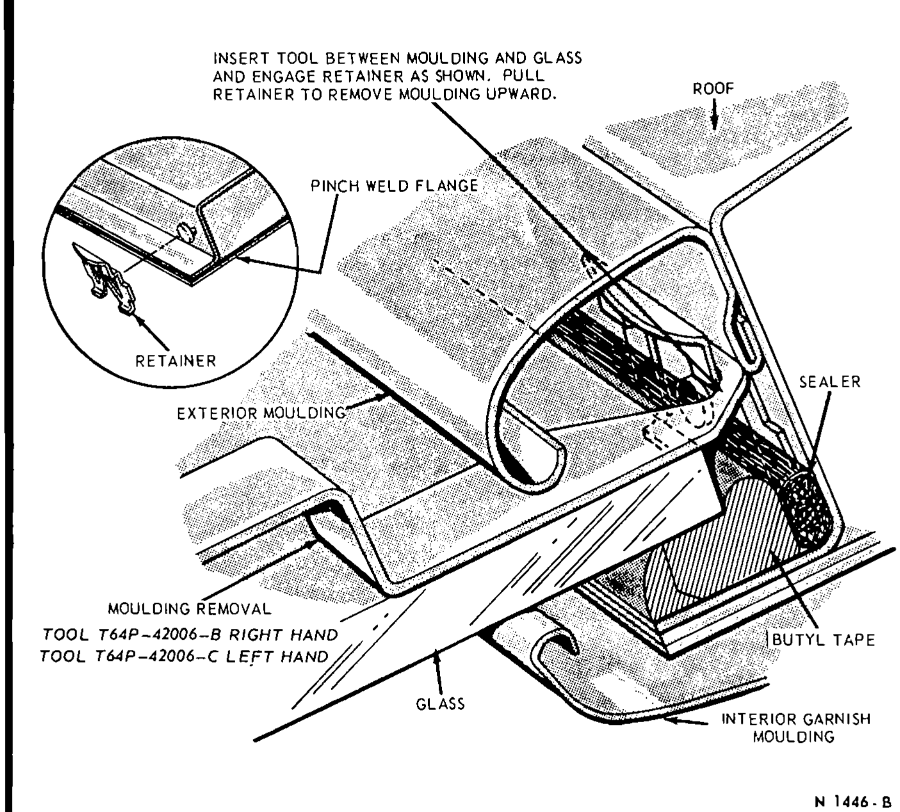


FIG. 23— Windshield or Back Window Moulding Removal

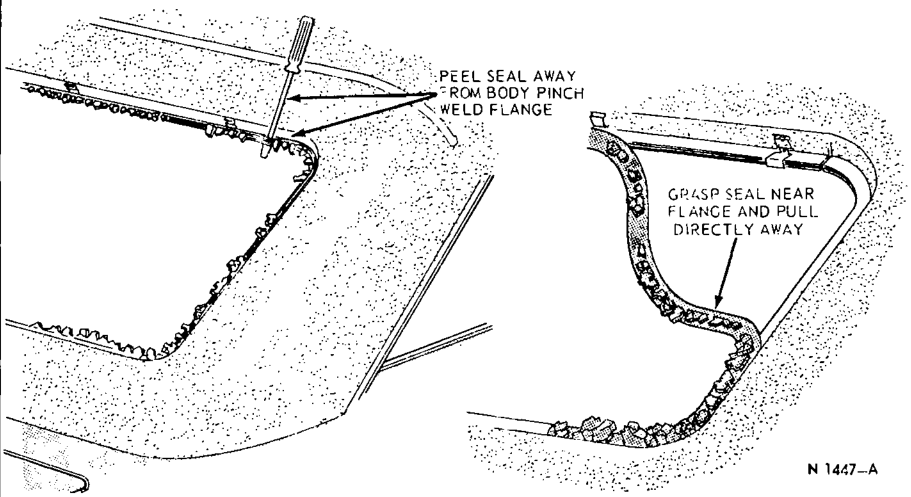


FIG. 24— Butyl Tape Removal

2. Install the three guide assembly attaching screws snug.
3. Place the clip on the regulator arm roller, and position the roller in the glass channel. Then, connect the roller to the window regulator.
4. Adjust the quarter window as outlined in Section 1 and tighten the guide assembly attaching screws.
5. Install the quarter trim panel and the rear seat back and seat cushion.

QUARTER WINDOW REAR GUIDE—MERCURY INTERMEDIATE AND FAIRLANE —MODEL 63

REMOVAL

1. Remove the rear seat cushion and seat back.
2. Remove the quarter window handle, arm rest, quarter trim panel, trim panel retainer and garnish moulding, and position the water shield away from the access hole.
3. Position the rear seat back panel cardboard away from the seat back panel.
4. Remove the quarter window rear guide retaining bolt and adjuster screw lock nut, and remove the rear guide.

INSTALLATION

1. Position the rear guide in the quarter and install the retaining bolt and adjuster screw lock nut snugly.
2. Check the operation of the glass, adjust it if necessary, and tighten the retaining bolt and adjuster screw lock nut.
3. Install the rear seat back panel cardboard.
4. Position the water shield, and install the garnish moulding, trim panel retainer, trim panel, regulator handle, and arm rest.
5. Install the rear seat back and seat cushion.

REAR QUARTER WINDOW AND/OR WEATHERSTRIP—MODEL 71

REMOVAL

1. Remove the spare tire cover and spare tire.
2. Remove the inside lower garnish moulding from the wheel well area.
3. Remove the quarter window inside front garnish moulding.
4. Remove the quarter window outside front moulding (Fig. 21).
5. Working from inside the vehicle, loosen the weatherstrip from the window opening flange, and push the window, weatherstrip and moulding assembly out of the opening.
6. Remove the moulding and weatherstrip from the glass.
7. Using solvent, remove all old sealer from the window opening flange, the window and the weatherstrip.

INSTALLATION

1. Apply a bead of sealer around the window opening flange.
2. Position the weatherstrip on the glass and install the outer moulding in the weatherstrip.
3. Install a draw cord in the weatherstrip, and apply Ru-Glyde to the weatherstrip surfaces that will contact the window opening flange.
4. Position the window assembly to the window opening and use the draw cord to pull the weatherstrip

over the window opening flange.

5. Using a caulking gun, apply sealer between the outside of the glass and the weatherstrip.

6. Install the outside front moulding retaining screws (Fig. 21).

7. Install the inside quarter window front garnish mouldings.

8. Install the inside lower garnish moulding.

9. Check for water leaks, then clean the glass and mouldings.

10. Install the spare tire and cover.

WINDSHIELD—MERCURY INTERMEDIATE, FALCON, AND FAIRLANE EXCEPT MODEL 76

REMOVAL

1. Remove the windshield wiper arms and blades.

2. Remove the cowl top panel grille.

3. On hardtop models, remove the roof side rail weatherstrip retaining screw and position the weatherstrip out of the retainer. Then, remove the first five weatherstrip retainer attaching screws.

4. Remove the windshield outside side moulding attaching screws (View B, Fig. 22) and remove the mouldings.

5. Remove the outside belt moulding retainer attaching screws and remove the mouldings and retainers (View D, Fig. 22).

6. Remove the outside top moulding with the tool shown in Fig. 23.

7. Remove the windshield interior upper garnish moulding.

8. If the glass has been shattered, remove the loose glass fragments from the car. Beginning at a corner, peel the butyl tape away from the body pinch weld flange; then, grasp the tape near the flange and pull directly away (Fig. 24).

9. If the glass is not shattered, insert a two foot length of piano wire between the pinch weld flange and the glass. Wrap each end of the wire around small wood dowels. With the aid of an assistant, cut the butyl tape all the way around the glass with a sawing motion and remove the glass.

10. Remove the two spacers from the lower edge of the windshield opening (View C, Fig. 22).

11. Clean the body flanges of all butyl tape and perform sheet metal or paint repairs, if necessary.

INSTALLATION

1. Install the two spacers on the lower flange of the windshield opening (View C, Fig. 22). Check the moulding retainers to assure adequate moulding retention. Repair or replace the retainers as necessary.

2. Temporarily position the replacement glass in the windshield opening and adjust the glass for the best glass to body flange overlap position. Mark this location with a crayon. Then, remove the glass and clean it thoroughly.

3. Apply primer (furnished in the butyl tape replacement kit C6AZ-19562-B) to the entire perimeter of the glass opening flange (Fig. 22).

4. Apply primer around the entire perimeter of the inside and edge of the glass in the area that will contact the butyl tape.

5. Allow the primer to dry ten minutes before installation of the glass or butyl tape.

6. Starting at one side of the glass opening, place the butyl tape on the glass opening flange with the sponge edge not more than 1/16 inch from the opening edge of the flange (View K, Fig. 22). **Do not allow the butyl tape to overhang the edge of the flange. Do not stretch the butyl tape when fitting it to the corners.** Carefully splice the two ends of the tape at the side of the glass opening (View G, Fig. 22).

7. Place the glass in the opening, using the crayon marks to locate the best position for equal seal contact.

8. Firmly press the glass against the butyl tape with hand pressure. Then, inspect the appearance of the butyl tape through the glass. A dull spot indicates an area where the butyl tape does not contact the glass surface. Additional hand pressure will seal most areas.

9. Remove any excess primer from the glass with a razor blade and wipe with a clean cloth damped in naphtha.

10. Water test the windshield installation around the entire perimeter of the glass. Repair any leaks by applying liquid butyl (C5AZ-19554-A) around the edge of the glass.

11. Install the windshield interior upper garnish moulding.

12. Install the windshield outside belt mouldings and retainers (Fig. 22).

13. Install the windshield outside top moulding.

14. Install the right and left outside mouldings (Fig. 22).

15. In hardtop models, position the weatherstrip retainer to the pillar and install the five attaching screws. Then, insert the weatherstrip in the retainer and install the weatherstrip end retaining screw.

16. Install the cowl top panel grille and windshield wiper arms and blades. Then, clean the windshield and surrounding area.

WINDSHIELD—MERCURY INTERMEDIATE AND FAIRLANE —MODEL 76

REMOVAL

1. Lower the top and remove the windshield pillar weatherstrips and weatherstrip retainers.

2. Remove the windshield wiper arms and blades.

3. Remove the windshield upper garnish moulding and sunvisors. Then, remove the outside top mouldings from the windshield header (Views C and G, Fig. 25).

4. Remove the windshield outside side mouldings (View B, Fig. 25).

5. Remove nine cowl top panel grille attaching screws and remove the grille.

6. Remove the outside belt moulding retainer attaching screws and remove the moulding and retainers (View E, Fig. 25).

7. Remove the mirror from the windshield.

8. If the glass has been shattered, remove the loose glass fragments from the car. Beginning at a corner, peel the butyl tape away from the body pinch weld flange; then, grasp the tape near the flange and pull directly away (Fig. 24).

9. If the glass is not shattered, insert a two foot length of piano wire between the pinch weld flange and the glass. Wrap each end of the wire around small wood dowels. With the aid of an assistant, cut the butyl tape all the way around the glass with a sawing motion and remove the glass.

10. Remove the two spacers from the lower edge of the windshield opening (View D, Fig. 25).

11. Clean the body flanges of all butyl tape and perform sheet metal or paint repairs, if necessary.

INSTALLATION

1. Install the two spacers (4) on the lower flange of the windshield opening (Fig. 25). Check the moulding retainers to assure adequate moulding retention. Repair or replace the retainers as necessary.

2. Temporarily position the replacement glass in the windshield opening and adjust the glass for the best glass to body flange overlap position. Mark this location with a crayon. Then, remove the glass and clean it thoroughly.

3. Apply primer (furnished in the butyl tape replacement kit C6AZ-19562-B) to the entire perimeter of the glass opening flange (View A, Fig. 25).

4. Apply primer around the entire perimeter of the outside and edge of

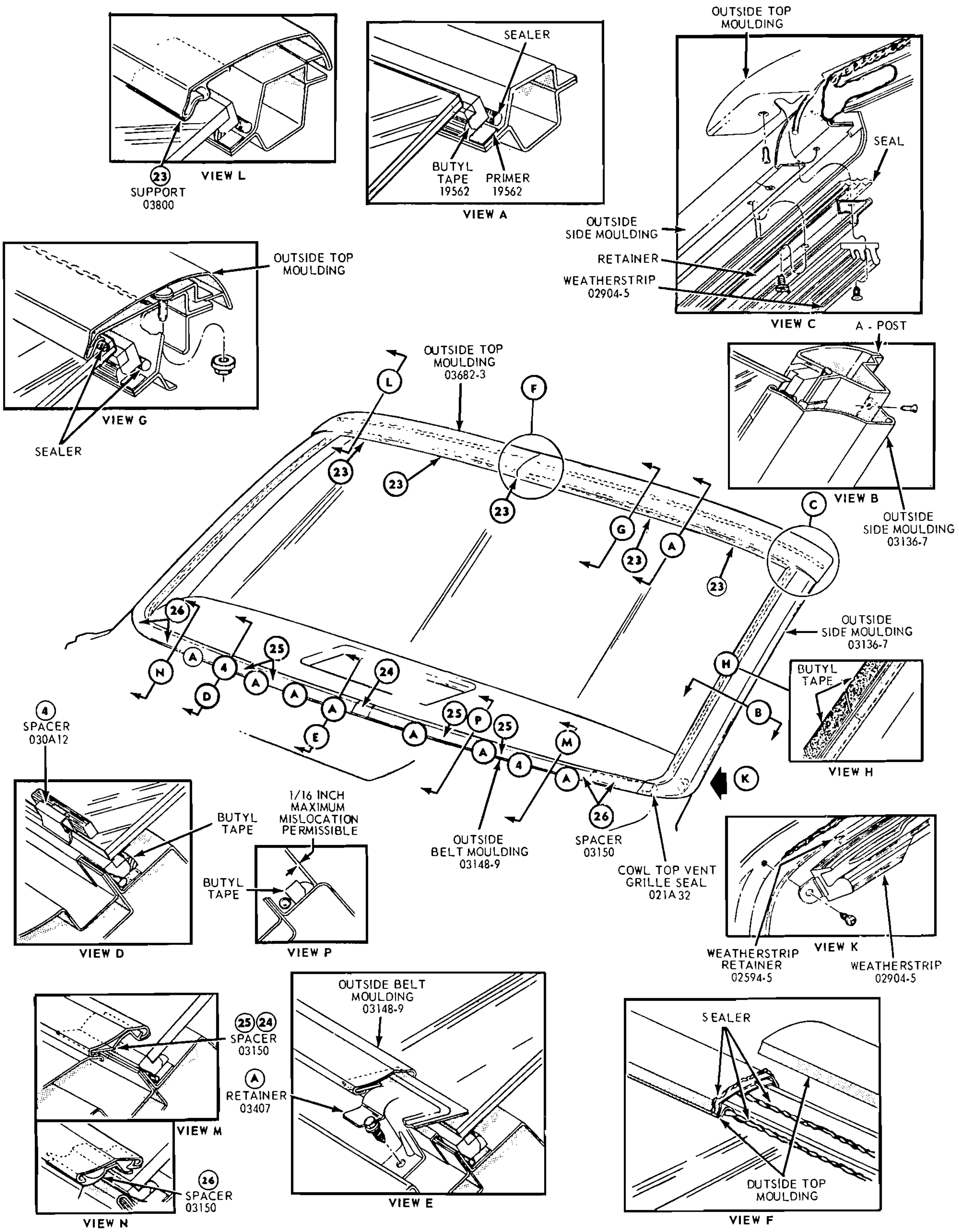


FIG. 25— Windshield and Moulding Installation—Mercury Intermediate and Fairlane Model 76

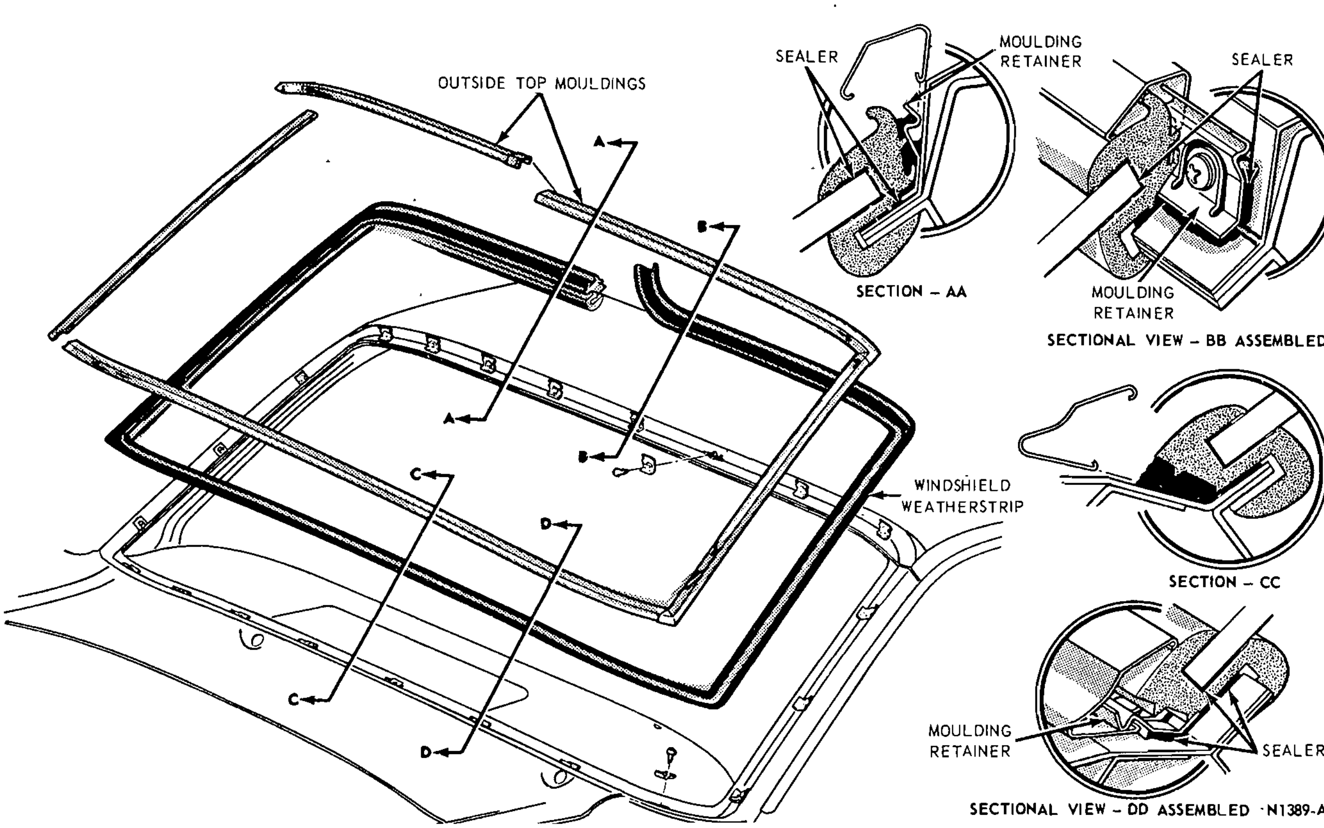


FIG. 26— Windshield Installation—Mustang—Models 63, 65 and Cougar

the glass in the area that will contact the butyl tape.

5. Allow the primer to dry ten minutes before installation of the glass or butyl tape.

6. Starting at one side of the glass opening, place the butyl tape on the glass opening flange with the sponge edge not more than 1/16 inch from the opening edge of the flange (View P, Fig. 25). **Do not allow the butyl tape to overhang the edge of the flange. Do not stretch the butyl tape when fitting it to the corners.** Carefully splice the two ends of the tape at the side of the glass opening (View H, Fig. 25).

7. Place the glass in the opening, using the crayon marks to locate the best position for equal seal contact.

8. Firmly press the glass against the butyl tape with hand pressure. Then, inspect the appearance of the butyl tape through the glass. A dull spot indicates an area where the butyl tape does not contact the glass surface. Additional hand pressure will seal most areas.

9. Remove any excess primer from the glass with a razor blade and wipe with a clean cloth dampened in naptha.

10. Water test the windshield installation around the entire perimeter of the glass. Repair any leaks by applying liquid butyl (C5AZ-19554-A) around the edge of the glass.

11. Position the outside belt moulding and retainers to the windshield lower edge and install the retainer attaching screws (View E, Fig. 25).

12. Install the cowl top panel grille.

13. Install the windshield outside side mouldings (Fig. 25).

14. Install the windshield outside top mouldings (Views F and G, Fig. 25).

15. Install the windshield upper garnish moulding and sunvisors.

16. Install the windshield pillar weatherstrip retainers and weatherstrips.

17. Install the windshield wiper arms and blades.

18. Install the rear view mirror on the windshield and raise the top.

WINDSHIELD—MUSTANG MODELS 63, 65 AND COUGAR

REMOVAL

1. Using Tool T64P42430 R or L, remove the top left and right outside windshield mountings (Fig. 26).

2. Using Tool T64P42430 R or L, remove the left and right windshield outside side mouldings.

3. Remove the windshield wiper arm and blade assemblies.

4. Using Tool T64P42430 R or L, remove the windshield outside belt mouldings (Fig. 26).

5. Remove the windshield and weatherstrip assembly by pushing outward along the inner edges of the windshield.

INSTALLATION

1. Remove the weatherstrip from the glass.

2. Clean all old sealer from the weatherstrip and the body opening flange. Check the moulding retainers to assure adequate moulding retention. Repair or replace the retainers as necessary.

3. Using a caulking gun, apply sealer in the weatherstrip glass opening.

4. Position the weatherstrip on the glass and install a draw cord in the body opening groove of the weatherstrip.

5. Using a caulking gun, apply a bead of sealer all the way around the body opening outer flange.

6. Apply rubber lubricant to the weatherstrip surface that contacts the body opening flange.

7. Position the windshield and weatherstrip assembly in the wind-

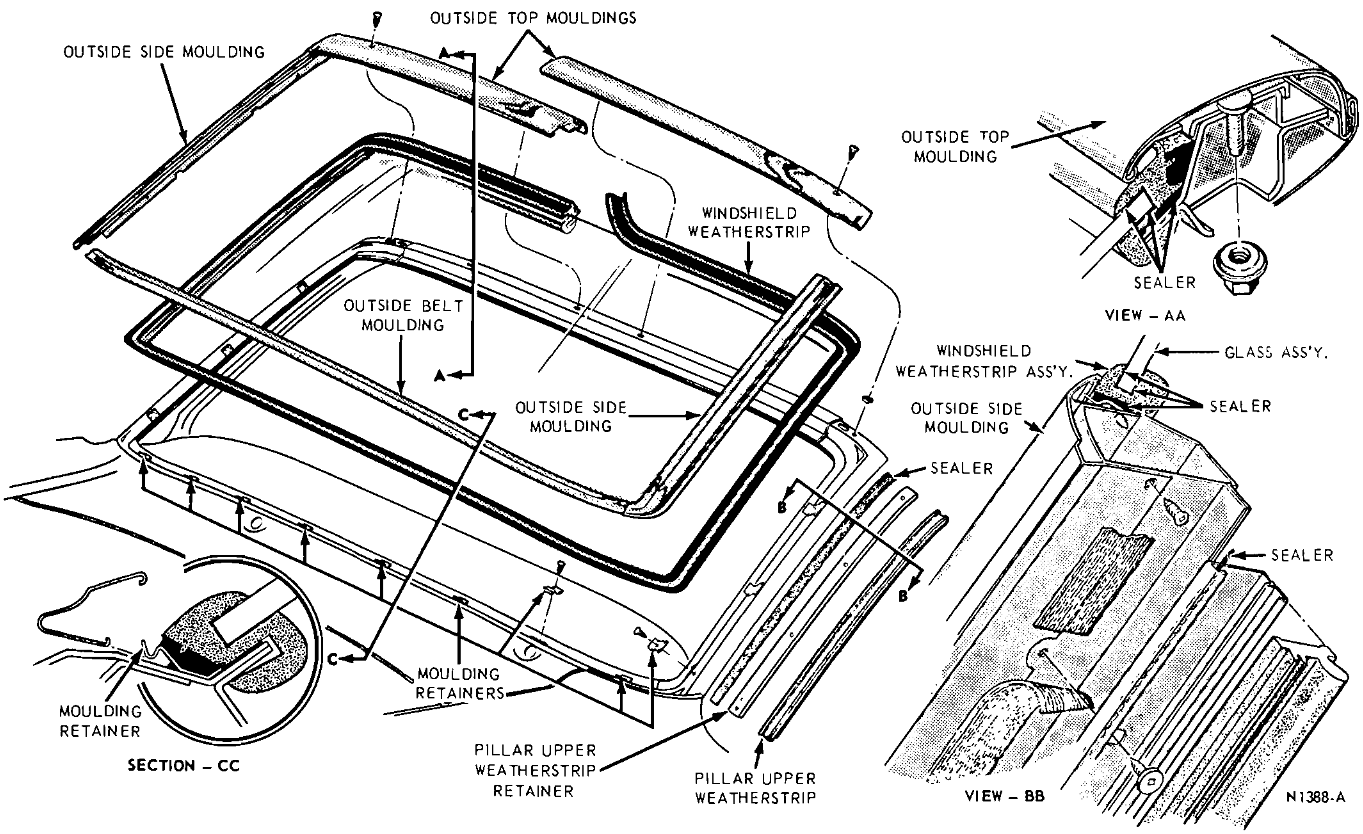


FIG. 27— Windshield Installation—Mustang Model 76

shield opening and, with a helper applying pressure from the outside, use the draw cord to pull the lip of the weatherstrip over the window opening lower flange, each side flange and then over the upper flange.

8. Install the outside belt moulding (Fig. 26) by positioning it and snapping it over its clip retainers.

9. Install the outside side mouldings by snapping them over their clip retainers.

10. Install the top right and left outside side mouldings by snapping them over their clip retainers.

11. Clean the windshield and mouldings.

12. Install the windshield wiper arm and blade assemblies.

WINDSHIELD—MUSTANG MODEL 76

REMOVAL

1. Lower the convertible top.

2. Remove the rear view mirror.

3. Remove the four upper garnish moulding retaining screws and remove the upper garnish moulding.

4. Remove the sun visor bracket and pivot retaining screws and remove the sun visor assemblies.

5. Remove the front upper body pillar weatherstrips (Fig. 27). Note that these weatherstrips are pressed into their retainers and attached with two screws, one at the top and bottom.

6. Remove the front upper body pillar weatherstrip retainer retaining screws (four) and remove the retainers.

7. Remove the retaining screw and two retaining nuts from each left and right windshield outside top moulding and remove the mouldings Fig. 27, View AA).

8. Remove the two retaining screws from each windshield outside side moulding and, using Tool T64P42430 R or L, remove the outside side mouldings.

9. Remove the windshield wiper arm and blade assemblies.

10. Using Tool T64P42430 R or L, remove the windshield outside belt moulding.

11. Remove the windshield and weatherstrip assembly by pushing outward along the inner edges of the windshield.

INSTALLATION

1. Remove the weatherstrip from the glass.

2. Clean all old sealer from the weatherstrip and the body opening flange. Check the moulding retainers to assure adequate moulding retension. Repair or replace the retainers as necessary.

3. Using a caulking gun, apply sealer in the weatherstrip glass opening.

4. Position the weatherstrip on the glass and install a draw cord in the body opening groove of the weatherstrip.

5. Using a caulking gun, apply a bead of sealer all the way around the body opening outer flange.

6. Apply rubber lubricant to the weatherstrip surfaces that contact the body opening flange.

7. Position the windshield and weatherstrip assembly in the windshield opening. With a helper applying pressure from the outside, use the draw cord to pull the lip of the weatherstrip over the window opening lower flange, each side flange and then over the upper flange.

8. Install the outside belt moulding (Fig. 27) by snapping the moulding over the retaining clips.

9. Install the outside side mouldings by snapping them over their retaining clips and install the retaining screws.

10. Position the left and right outside top mouldings and install the retaining screws and nuts.

11. Position the left and right

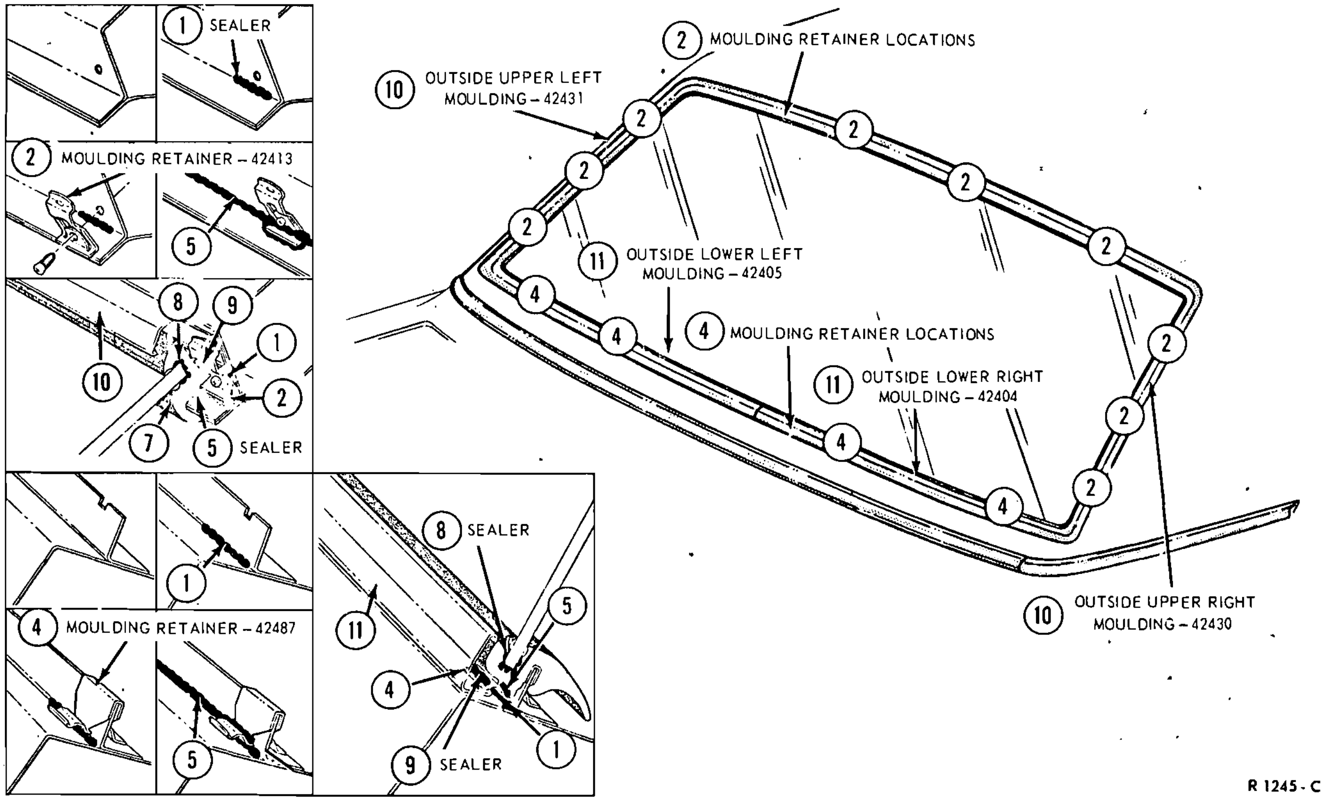


FIG. 28— Back Window Installation—Mercury Intermediate, Falcon, Fairlane

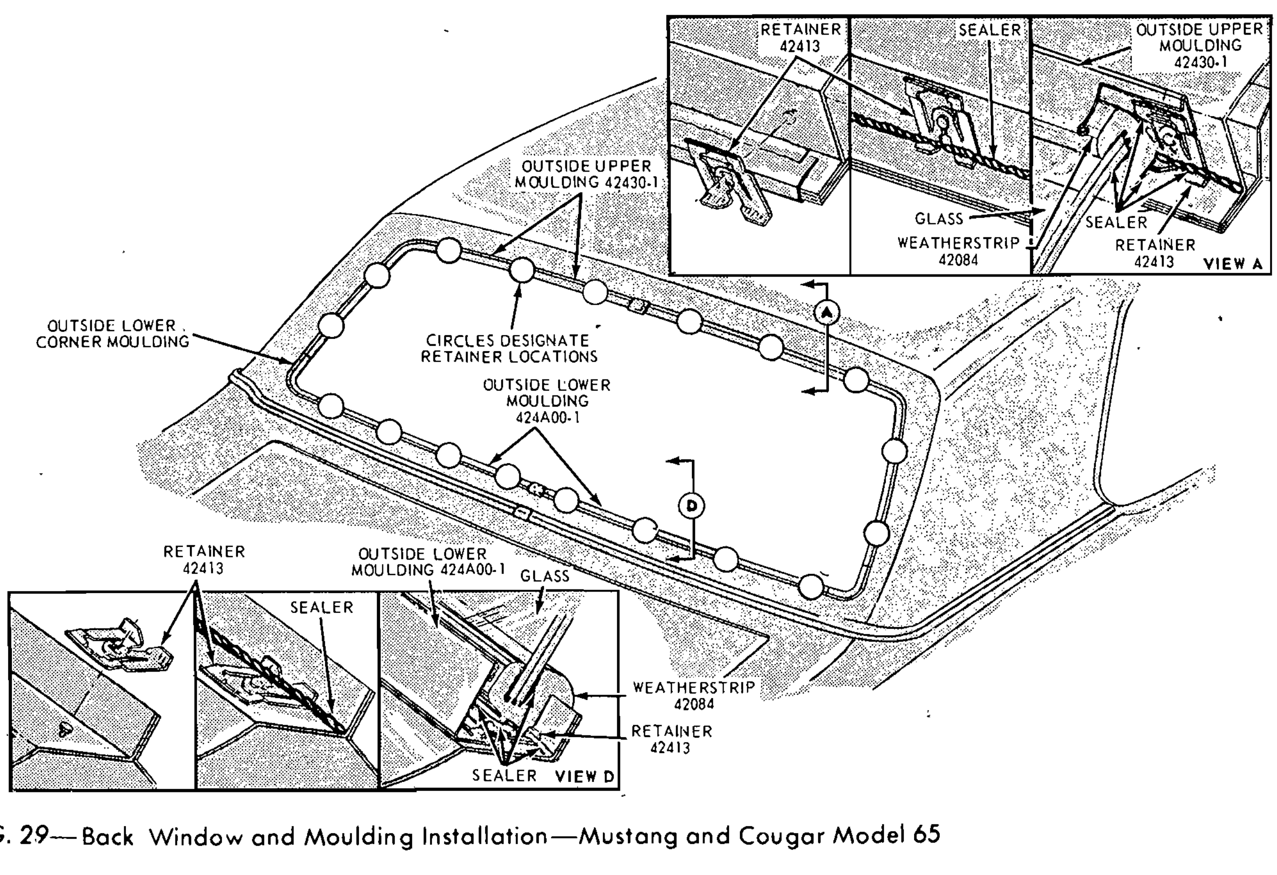


FIG. 29— Back Window and Moulding Installation—Mustang and Cougar Model 65

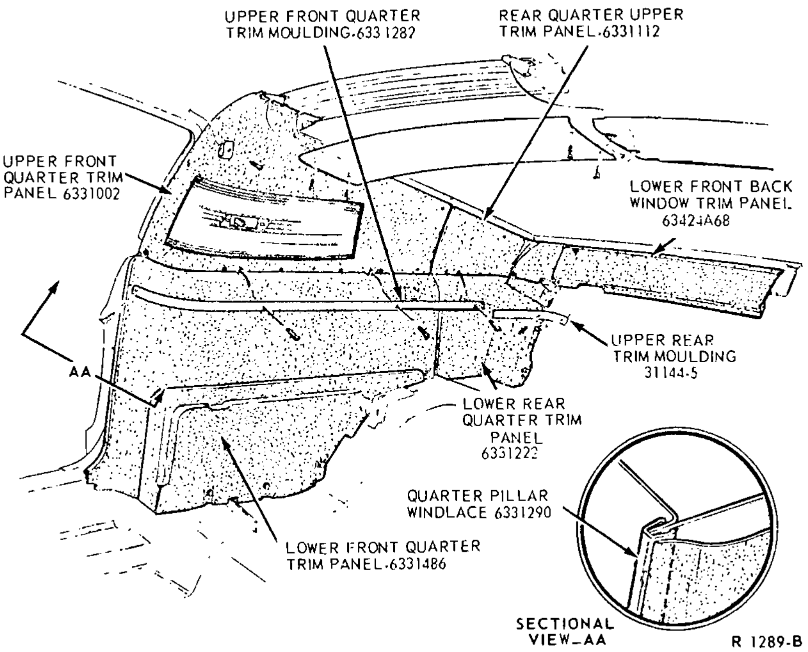


FIG. 30—Interior Moulding and Quarter Trim Panel Installation—Mustang Model 63

front upper body pillar weatherstrip retainers (Fig. 27) and install the retaining screws.

12. Install the front upper body pillar weatherstrips by pressing them securely into their retainers and installing the attaching screws.

13. Install the sun visor bracket and pivot assemblies.

14. Position the upper garnish moulding and install the garnish moulding retaining screws.

15. Install the rear view mirror.

16. Clean the windshield and mouldings.

17. Install the wiper arm and blade assemblies.

BACK WINDOW AND/OR WEATHERSTRIP—FALCON, FAIRLANE AND MERCURY INTERMEDIATE—EXCEPT MODELS 66, 71, 76

REMOVAL

1. Using Tool T64-P42430-R or L, release the outside upper mouldings (Fig. 28), from their moulding retainers and remove the outside upper mouldings.

2. Using Tool T64-P42430-R or L, release the outside lower mouldings from their moulding retainers and remove the outside lower mouldings.

3. From inside the car, loosen the weatherstrip edges and then push out the back window and weatherstrip as an assembly.

4. Place the window assembly on a bench and remove the weatherstrip from the glass.

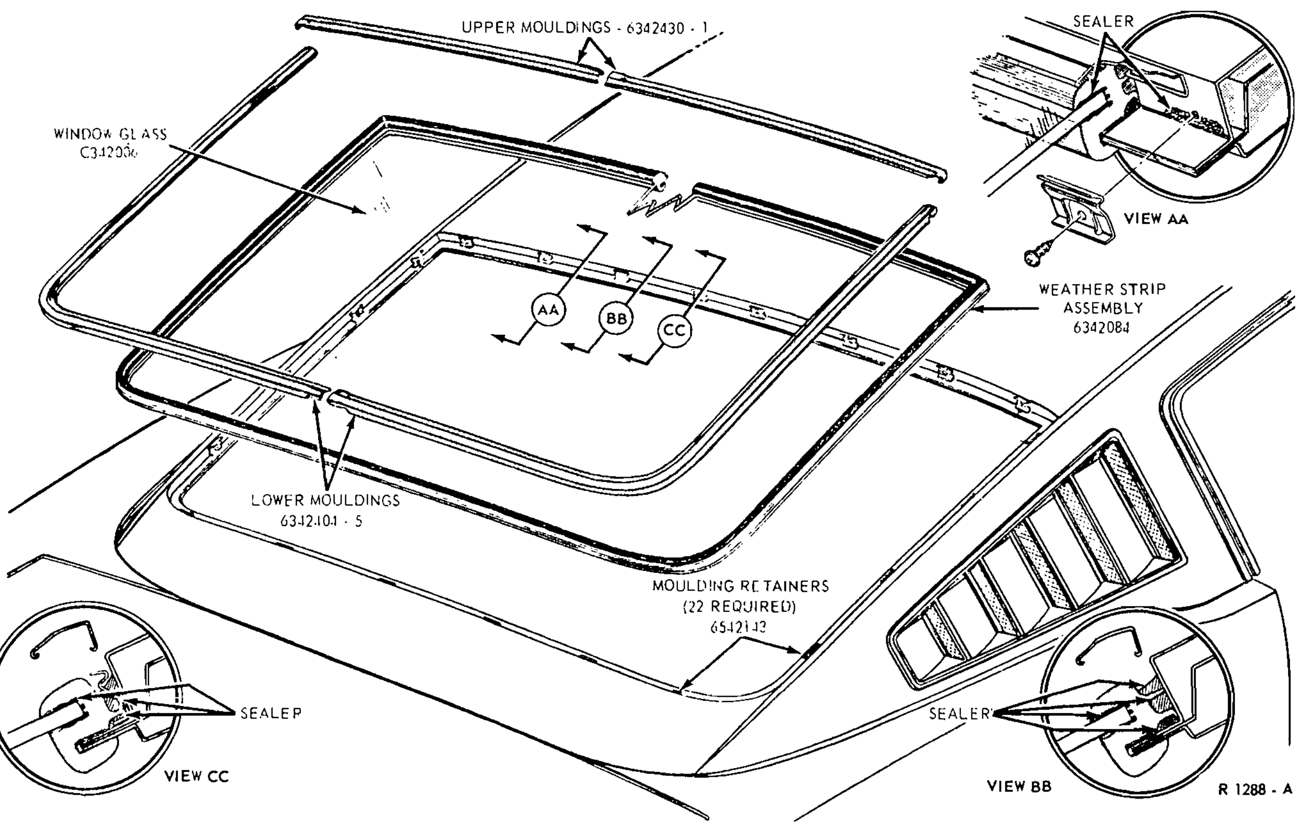


FIG. 31—Back Window Installation—Mustang Model 63

INSTALLATION

1. Clean the glass, weatherstrip and the body opening flange. Check the moulding retainers to assure adequate moulding retention. Repair or replace the retainers as necessary.
2. Using a sealer gun, apply sealer in the weatherstrip glass opening.
3. Position the weatherstrip on the glass.
4. Install a draw cord in the body opening groove of the weatherstrip. Apply rubber lubricant to the weatherstrip surfaces that will contact the back window opening flange.
5. Using a sealer gun, apply a bead of sealer completely around the back window opening.
6. Position the window assembly in the body opening. With a helper applying hand pressure from the outside, use the draw cord to pull the lips of the weatherstrip over the window opening flanges.
7. Install the outside lower left and right mouldings.
8. Install the outside upper left and right mouldings.
9. Clean the window and mouldings.

BACK WINDOW—MUSTANG AND COUGAR MODEL 65

1. Remove the back window outside mouldings (Fig. 29) with Tools T64P-42430-R and/or L.
2. Loosen the weatherstrip at the window opening and push the glass and weatherstrip from the opening.
3. Remove the weatherstrip from the glass and clean all sealer from the weatherstrip and/or glass if either one is to be re-used. Check the moulding retainers to assure adequate moulding retention. Repair or replace the retainers as necessary.
4. Remove all old sealer from the window opening.
5. With a caulking gun, apply sealer in the glass opening groove of the weatherstrip. Apply rubber lubricant to the weatherstrip surfaces that will contact the back window opening flanges during installation.
6. Position the weatherstrip on the glass and install a draw cord in the body opening groove of the weatherstrip.
7. With a caulking gun, apply a bead of sealer all the way around the body window opening flange.
8. Position the window and weatherstrip assembly in the body opening and, with a helper applying pressure from the outside, use the draw cord to pull the lip of the

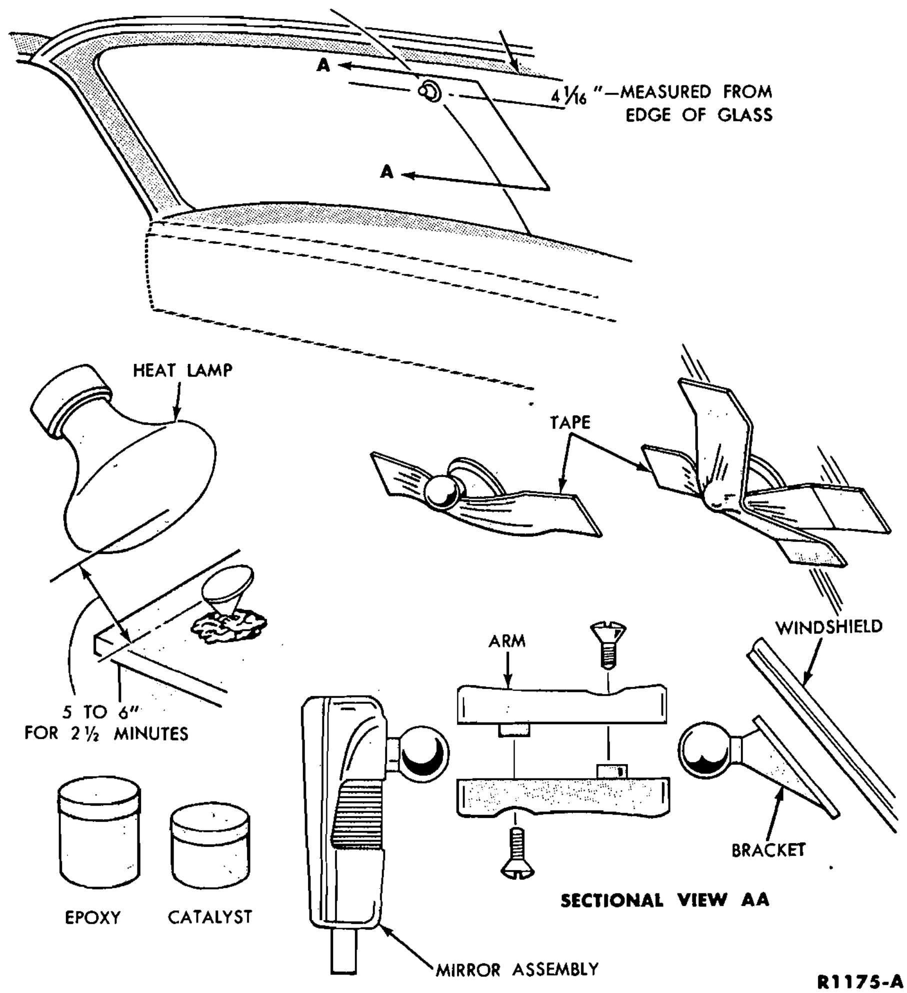


FIG. 32—Bonded Rear View Mirror Installation

weatherstrip over the body window opening flange.
9. Install the back window outside mouldings (Fig. 29).

BACK WINDOW—MUSTANG MODEL 63

REMOVAL

1. Remove the quarter trim upper front moulding retaining screws and remove the quarter trim upper front mouldings.
2. Remove the quarter trim upper rear moulding cap retaining screw and remove the cap. Remove the quarter trim upper left and right rear moulding retaining screws and remove the mouldings. (Fig. 30).
3. Remove the back window garnish moulding upper joint cover. Remove the back window upper left and right garnish moulding retaining screws and remove the mouldings (Fig. 30).
4. Remove the left and right vent air extractor grille assembly (quarter trim upper front panels) retaining screws and remove the panels (Fig. 30).
5. Remove the back window lower front left and right trim panel retaining bolts and screws and remove the panels (Fig. 30).
6. Remove the quarter trim upper rear left and right panel retaining screws and remove the panels.
7. Using moulding removal Tool T64P-42006-A or B, remove the back window exterior mouldings in the following order: right upper moulding, right lower moulding, left upper moulding and left lower moulding (Fig. 31).
8. With an assistant applying pressure from the inside, remove the back window and weatherstrip assembly.
9. Remove the weatherstrip from the glass.

INSTALLATION

1. Clean excess old sealer from the body window opening. Check the moulding retainers to assure adequate moulding retention. Repair or replace the retainers as necessary.
2. Clean old sealer from the

weatherstrip if the weatherstrip is to be re-used.

3. Position the weatherstrip on the glass and install a pull cord (1/8 inch sash cord) around the weatherstrip body opening groove. Apply rubber lubricant to the weatherstrip surfaces that will contact the back window opening flanges during installation.

4. Apply a bead of sealer around the entire perimeter of the back window opening flange. With the aid of an assistant, position the glass and weatherstrip assembly in the body window opening. Use the pull cord to pull the lip of the weatherstrip over the pinchweld while applying pressure to the glass from the outside.

5. Apply sealer between the weatherstrip and the outside pinchweld flange.

6. Apply sealer in the glass opening groove of the weatherstrip.

7. Snap the window exterior mouldings into place in the following order; left lower moulding, left upper moulding, right lower moulding and right upper moulding.

8. Install the upper rear left and right quarter trim panels.

9. Install the upper front left and right quarter trim panels.

10. Install the back window lower front trim panel.

11. Install the upper rear left and right quarter trim mouldings and moulding cap.

12. Install the upper front left and right quarter trim mouldings.

13. Install the back window upper left and right garnish mouldings and garnish moulding joint cover.

14. Clean the back window and mouldings.

BONDED REAR VIEW MIRROR

REMOVAL

1. Clean both the inside and outside surfaces of the windshield in the area of the mirror mounting bracket. Inspect the windshield for stone chips and scratches.

2. Using welding putty or wet rags, insulate all chips or scratches within 12 inches of the mirror mounting bracket.

3. Apply heat to the bracket mounting area from outside the windshield with a standard 250 watt infrared bulb (heat lamp). Hold the lamp approximately 4 inches from the windshield, and rotate it in a small circle.

4. The mirror mounting bracket can be pulled off the windshield glass in approximately 8-10 minutes using the mirror as a handle.

5. Slowly remove the heat lamp. **Do not remove the insulating materials until the windshield has cooled to room temperature.**

6. Remove the mirror and arm from the bracket.

INSTALLATION

1. Locate and mark with a wax pencil the bracket location on the outside surface of the windshield (Fig. 32).

2. Use a good grade of Ethyl Alcohol to thoroughly clean the inside glass surface bracket mounting area and mounting bracket face. It is important that the mounting surfaces are properly cleaned before the resin is applied.

3. To mix the resin pour the entire contents of the small catalyst bottle into the large epoxy bottle (Fig. 32).

4. Stir the contents for 3 to 5 minutes.

To guarantee the correct mixing ratio and resulting bond strength it is mandatory that the entire contents of both bottles are used and properly mixed. Under no circumstances should only portions of the epoxy or catalyst be used.

5. Apply the mixed resin to the bracket mounting surface. Level off the resin film as smoothly as possible.

6. Place the mounting bracket surface upward in a vise or in a small mound of permagum or any suitable holding material that will support the mounting bracket (Fig. 32). Hold a standard 250 watt infrared lamp about 5 to 6 inches from the mounting surface of the bracket for 2 1/2 minutes.

7. Allow the bracket to cool for one minute. With light hand pressure apply the mounting surface of the bracket to the desired inside area of the windshield.

8. Secure the bracket to the windshield using a piece of tape about 5 inches long located just under the knob of the bracket. Apply another piece of tape in the vertical direction to firmly hold the mounting bracket in place on the windshield.

9. When the temperatures are above 67° F., the mirror and arm should not be mounted to the bracket for 8 hours, to allow the resin to properly adhere the bracket to the glass. However, the car may be used with the bracket taped in place one hour after installation.

When the temperatures are below 67° F., the mirror and arm should not be mounted to the bracket for 16 hours. However, the car can be used 2 hours after the bracket has been taped in place.

10. After the bracket has had time to adhere to the glass, remove the tape and install the mirror and arm to the bracket.

TAILGATE GLASS

REMOVAL

1. Open and temporarily support the tailgate.

2. Remove the tailgate cover panel retaining screws and remove the panel.

3. Remove the window regulator arm roller retaining pins, disconnect the arms from the rollers, and remove the rollers from the glass channel.

4. Remove the window from the tailgate.

INSTALLATION

1. With a glass remover tool, remove the glass lower retainer and channel, and weatherstrip.

2. Remove the weatherstrip from the glass lower retainer and channel assembly, and then clean the glass groove.

3. Position the weatherstrip into the glass lower channel. Install the weatherstrip and channel to the glass.

4. Slide the window assembly into the glass runs and connect the regulator arms and rollers to the glass lower channel.

5. Apply Lubriplate to the glass rollers.

6. Clean the old sealer from the tailgate cover panel and apply new sealer.

7. Install the tailgate cover panel to the tailgate.

8. Connect the tailgate hinge supports and remove the temporary support.

TAILGATE WINDOW REGULATOR

REMOVAL

If the tailgate window regulator mechanism should fail with the window in a partially closed or closed position, refer to the emergency procedure in Section 1.

1. Open and temporarily support the tailgate.

2. Disconnect the tailgate hinge supports at the tail gate.

3. Remove the tailgate cover panel retaining screws and remove the panel.

4. Remove the window regulator

arm roller retaining pins, disconnect the arms from the rollers, and remove the rollers from the glass channel.

5. Remove the tailgate window from the tailgate and scribe the regulator mounting location.

6. Remove the regulator retaining bolts and remove the regulator.

INSTALLATION

1. Place the regulator manual drive spline into the handle, align the regulator, and install the regulator retaining bolts.

Install the window assembly in the tailgate.

2. Clean the old sealer from the tailgate cover panel and apply new sealer.

3. Install the tailgate cover panel to the tailgate.

TAILGATE POWER WINDOW REGULATOR

REMOVAL

If the tailgate window regulator mechanism should fail with the window in a partially closed or closed position, refer to the emergency procedure in Section 1.

1. Open and temporarily support the tailgate.

2. Disconnect the tailgate hinge supports at the tailgate.

3. Remove the tailgate cover panel retaining screws and remove the panel.

4. Remove the window regulator arm roller retaining pins, disconnect the arms from the rollers, and remove the rollers from the glass channel.

5. Remove the window from the tailgate.

6. Disconnect the motor leads from the wiring harness in the tailgate.

7. Scribe the regulator mounting location, remove the regulator retaining bolts, and remove the regulator with the motor attached.

INSTALLATION

1. **Do not remove the electric regulator drive assembly for transfer to the new regulator until the regulator counterbalance spring is unloaded.** To unload the regulator counterbalance spring, place the spring in a vise so that the spring cannot unwind, disconnect the spring from the outer retaining tab, and then slowly loosen the vise jaws.

2. Remove the screws retaining the regulator drive assembly and the motor to the regulator and remove the drive assembly and motor.

3. Position the drive assembly and motor to the new regulator and install the retaining screws.

4. Drill out the rivets retaining the manual clutch and housing assembly to the regulator. Remove and discard the manual drive assembly. **The manual clutch and gear assembly should not be removed until the electric drive assembly is installed.**

5. Install the regulator assembly on the tailgate and align the regulator as required.

6. Connect the wiring harness to the motor and secure the harness in place with the retainer.

7. Install the window assembly into the tailgate.

8. Apply Lubriplate to the glass rollers.

9. Clean the old sealer from the tailgate cover panel and apply new sealer.

10. Install the tailgate cover panel to the tailgate.

11. Connect the tailgate hinge supports and remove the temporary support.

TAILGATE SWITCH AND LOCK CYLINDER—POWER WINDOW

REMOVAL

1. Open and temporarily support the tailgate.

2. Disconnect the tailgate hinge supports at the tailgate.

3. Remove the tailgate cover panel retaining screws and remove the panel.

4. Remove the window regulator arm roller retaining pins, disconnect the arms from the rollers, and remove the rollers from the glass channel.

5. Remove the window from the tailgate.

6. Remove the regulator.

7. Remove the nuts retaining the lock and switch, and then remove the lock and lock cylinder from the tailgate (Fig. 33).

8. If the switch requires replacement, disconnect the switch wires from the tailgate wiring harness and remove the switch and wires.

9. To remove the lock cylinder, depress the lock cylinder retaining pin, insert the key and rotate the cylinder until the retaining pin drops, and then remove the lock cylinder.

INSTALLATION

1. To install the lock cylinder, insert the key in the lock cylinder and slide the cylinder into the retainer.

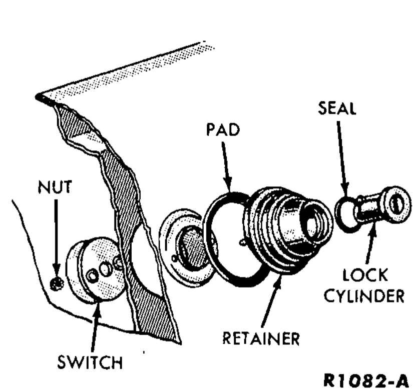


FIG. 33—Tailgate Switch and Lock Cylinder Installation—Typical

2. To install the switch assembly, route the wiring harness through the tailgate to the tailgate harness switch connector.

3. Place the lock assembly and gasket to the tailgate and position the switch to the lock assembly. It may be necessary to rotate the lock cylinder to align the switch and the lock. Install the retaining nuts.

4. Install the window regulator.

5. Install the tailgate window assembly into the tailgate.

6. Apply Lubriplate to the glass rollers.

7. Clean the old sealer from the tailgate cover panel and apply new sealer.

8. Install the tailgate cover panel to the tailgate.

9. Connect the tailgate hinge supports and remove the temporary support.

TAILGATE MANUAL WINDOW HANDLE AND LOCK CYLINDER

REMOVAL

1. With the tailgate window in the closed position, unlock the tailgate handle, and rotate the handle assembly to reveal the mounting screws (Fig. 34).

2. Remove the handle mounting screws, and then remove the handle assembly and pad.

3. To remove the lock cylinder turn the key in the cylinder to align the cylinder locking pin with the access hole in the handle assembly. Depress the locking pin and remove the lock cylinder.

INSTALLATION

1. To replace the lock cylinder, transfer the O-rings, and then with the key in the cylinder, install the lock cylinder in the handle assembly.

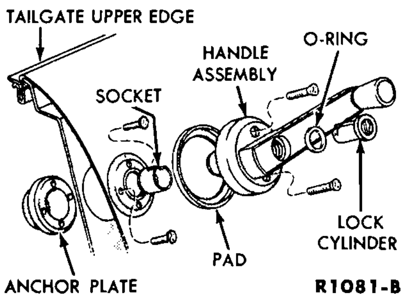


FIG. 34—Tailgate Window Regulator Handle Installation—Typical

2. If the window regulator has been replaced, it may be necessary to reposition the handle assembly so that it hangs in a vertical position, with the tailgate window in a closed position. To adjust the handle position, remove the snap ring and socket from the window regulator stem, and then install the socket with the notch at the top.
3. Install the pad and handle assembly.

DUAL—ACTION TAILGATE HINGES

REMOVAL AND INSTALLATION

Upper Left Hinge

1. Open the tailgate (horizontally, as a dropgate) and scribe a location mark around that part of hinge to be replaced.
2. Remove the hinge retainer screws.
3. Position the hinge to the scribe marks and install the retainer screws.

Lower Left Hinge

1. Open the tailgate (horizontally, as a dropgate) and position a support under the hinge side of the gate.
2. Remove the tailgate door check. Raise the tailgate partially and remove the torsion bar retainer link from the body.
3. Scribe the hinge location on the body and the tailgate. Remove the hinge retainer screws and remove the hinge.
4. Position the hinge to the body and tailgate scribe marks and install the hinge retainer screws.
5. Close the tailgate and check for proper lower hinge alignment. Adjust the hinge if necessary.
6. Open the tailgate partially and install the torsion bar retainer link to the body.
7. Install the tailgate door check.

SINGLE ACTION TAILGATE HINGE—FALCON AND MERCURY INTERMEDIATE MODEL 71 —FAIRLANE MODEL 66

REMOVAL

1. Open the tailgate and mark the hinge location on the tailgate and body.
2. Retain the torsion bar in the tension position with a deep socket and an extension.
3. Remove the torsion bar retainer bracket attaching screws. Then, release the torsion bar tension and remove the bracket and retainer (Fig. 35).
4. Remove the hinge-to-body and hinge-to-tailgate attaching bolts and remove the hinge.

INSTALLATION

1. Position the hinge to the body and tailgate and install the attaching bolts.
2. Close the tailgate and check the alignment of the tailgate.
3. Adjust the hinge alignment as required for a proper fit and appearance.
4. Install the torsion bar bracket and retainer.

DUAL—ACTION TAILGATE LATCHES

RIGHT LOWER LATCH

1. Open the tailgate (side opening). Remove the tailgate trim panel, watershield and access panel.
2. Disconnect the linkage from the latch. Remove the three retaining screws and remove the latch.
3. Transfer the linkage retainer clips to the new latch. Position the latch in the gate and install the retainer screws.
4. Install the linkage to the latch. Install the access cover, watershield and trim panel.

RIGHT UPPER LATCH

1. Open the tailgate (side opening). Remove the tailgate trim panel, watershield and access panel.
2. Engage the upper latch pawl to the closed position and raise the window partially out of the gate. Remove the regulator arms from the window regulator channel and remove the window assembly.
3. Disconnect the linkage at the upper latch. Remove the wire connector from the upper latch safety switch.
4. Remove the right guide upper retainer bolt. Remove the three screws retaining the latch and remove the latch assembly.
5. Transfer the linkage retainer clips and the safety switch to the new latch assembly.
6. Position the latch in the gate and install the latch retainer screws. Install the window guide upper retainer bolt.
7. Connect the wire connector to the switch and connect the linkage to the latch.
8. Position the window assembly in the gate and install the regulator arms to the regulator channel. Close the latch pawl to engage the switch and lower the window into the tailgate.
9. Install the tailgate access panel, watershield, and trim panel. Open the upper latch and close the tailgate. Check the latch alignment to the striker. Adjust the latch striker if necessary.

SINGLE ACTION TAILGATE LATCH—FALCON AND MERCURY INTERMEDIATE—MODEL 71—FAIRLANE MODEL 66

REMOVAL

1. Open the tailgate and remove the trim panel cover and watershield.
2. Remove the tailgate access panel cover (Fig. 35).
3. Disconnect the latch release link from the latch.
4. Trip the latch to the closed position and run the window 3/4 of the way out of the tailgate (except Model 66).
5. Remove the window guide upper retainer screw (except Model 66).
6. Remove three latch attaching screws and remove the latch.
7. Transfer the latch switch to the new latch (except Model 66).

INSTALLATION

1. Position the latch in the tailgate and install the attaching screws.
2. Install the window guide retaining screw (except Model 66).
3. Lower the window and open the latches (except Model 66).
4. Connect the latch release link to the latch.
5. Install the tailgate access panel cover, weathersheet, and trim panel.

DUAL—ACTION TAILGATE TORSION BAR

REMOVAL

1. Remove the tailgate trim panel, watershield and access cover.

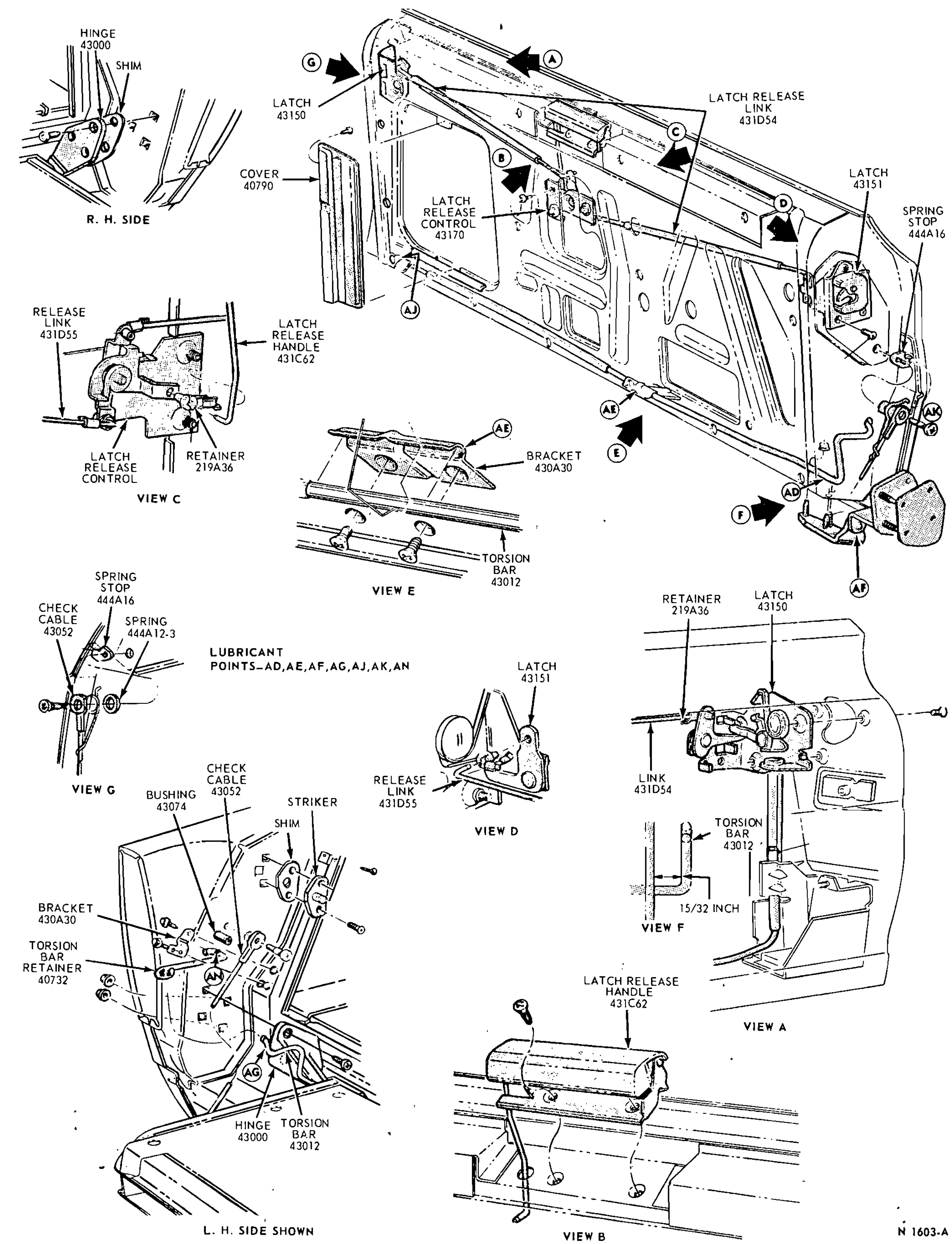


FIG. 35—Tailgate Latch Mechanism—Single Action

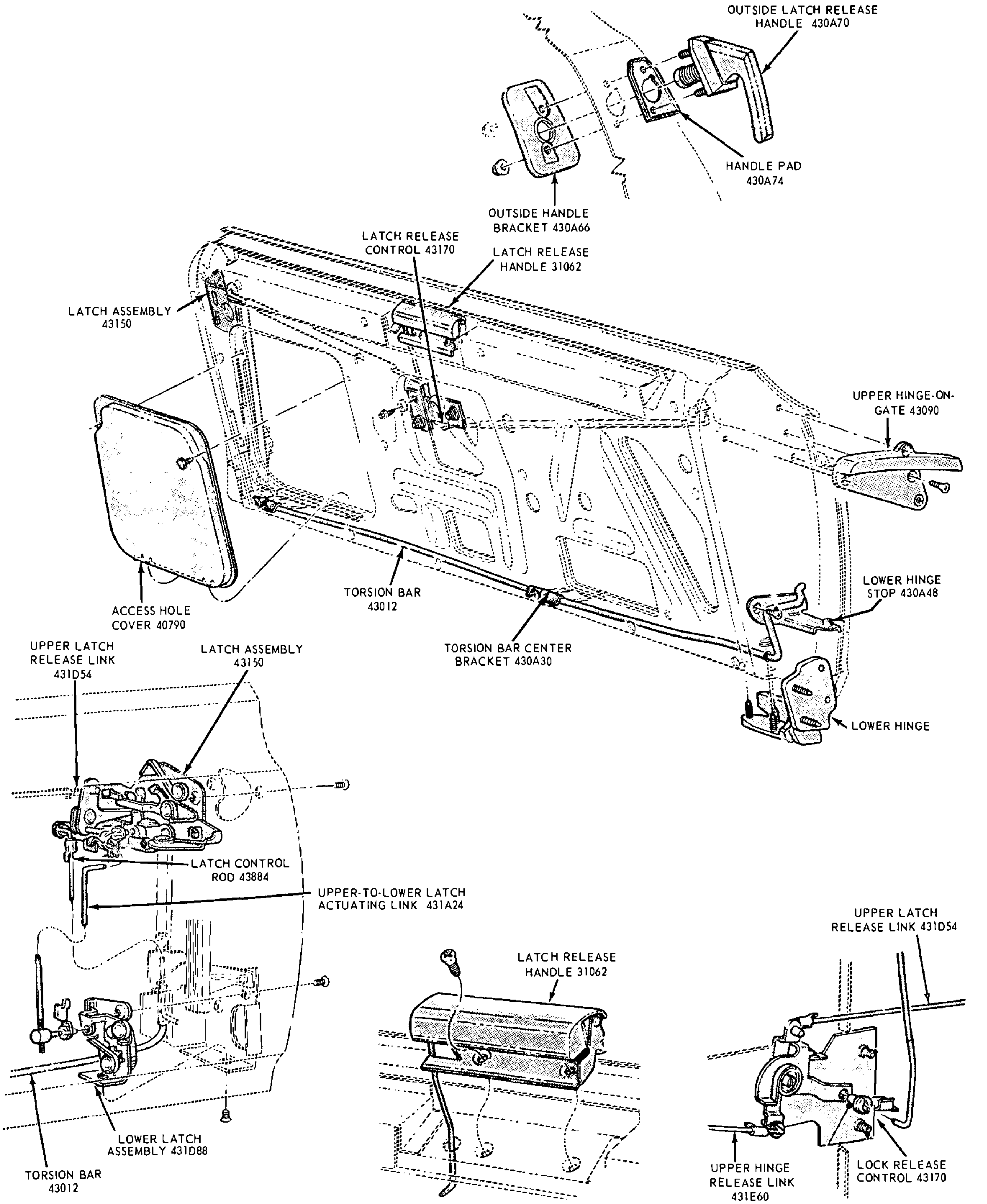


FIG. 36—Tailgate Latch Mechanism—Dual Action

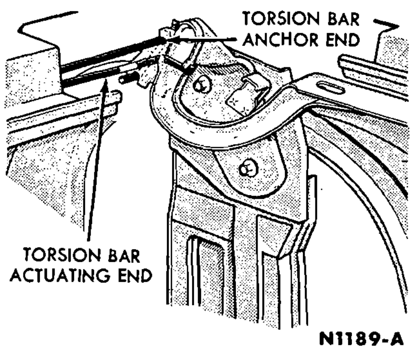


FIG. 37—Luggage Compartment Door Torsion Bar—Typical

2. Move the tailgate glass out partially by closing the right upper latch pawl and turning the key in the tailgate cylinder.
3. Remove the latch control bellcrank assembly and window lower stop.
4. Loosen the window regulator motor harness to gain slack at the tailgate-to-body location.
5. Raise the tailgate partially and remove the torsion rod retainer link from the body (2 screws).
6. With an assistant, remove the left lower hinge pivot bolt. Unlatch the right lower latch, remove one check cable retainer screw from each side and move the tailgate assembly away from the body opening. Place the tailgate on an appropriate stand approximately bumper high.
7. Remove the torsion bar retainer bracket and remove the torsion bar from the left side of the gate (Fig. 36).

INSTALLATION

1. Place the torsion bar in its respective mounting position and install the torsion bar right retainer bracket.
2. With an assistant, position the tailgate assembly to the body opening. Engage the right lower latch to the striker plate. Install the left hinge pivot bolt and install the check cable retainer screws.
3. Install the torsion bar retainer link to the body.
4. Position the motor wiring harness in its original position.
5. Install the window lower stop and lock the bellcrank assembly.
6. Lower the window in the tailgate to where the top edge of the glass is even with the weatherstrip and adjust the lower stop if necessary.
7. Install the tailgate access cover, watershield and trim panel.

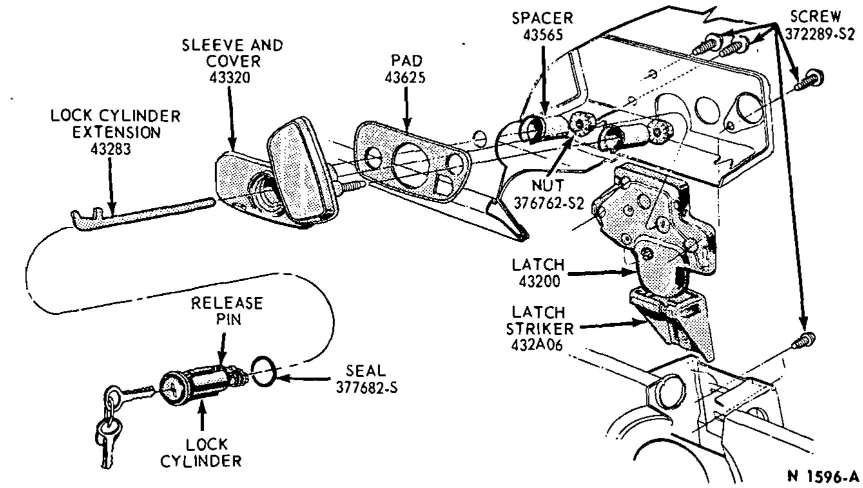


FIG. 38—Luggage Compartment Latch Installation—Cougar—Typical Falcon and Mercury Intermediate

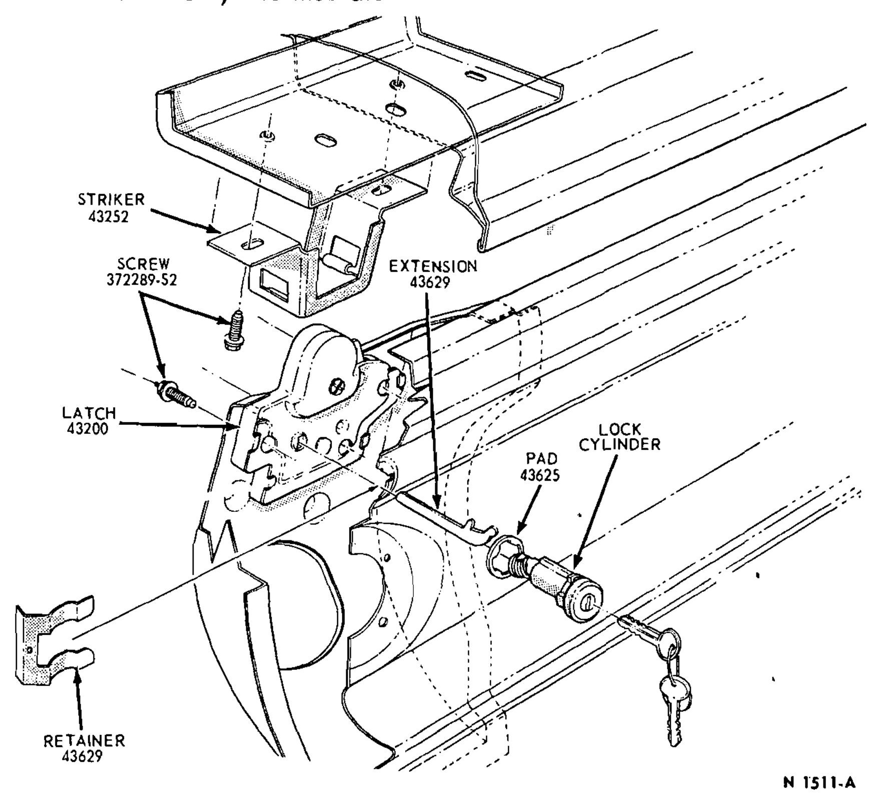


FIG. 39—Luggage Compartment Latch Mechanism—Mustang—Typical Fairlane

LUGGAGE COMPARTMENT DOOR HINGE OR TORSION BAR—MUSTANG AND COUGAR

REMOVAL

1. Prop the deck lid open.
2. Mark the hinge position on the lid and on the mounting bracket for reference when a new hinge is installed.
3. Using a tool T64K-44890-B pry the anchor end of the torsion bar out of its adjustment notch (Fig. 37). Lower the deck lid and from inside the luggage compartment remove the bar.
4. Position a cover under the hinge edge of the deck lid to prevent paint damage. Remove the hinge attaching bolt from the deck lid and from the mounting bracket, and remove the hinge.

INSTALLATION

1. Position the hinge, and par-

tially tighten the mounting bolts.

2. Remove the protective cover and install the torsion bar, reversing the procedure in step 3 above. The farther rearward the anchor end is twisted, the greater the tension.

3. Remove the prop and check the lid position. After any necessary adjustment, tighten the hinge attaching bolts.

LUGGAGE COMPARTMENT LOCK CYLINDER—FAIRLANE AND MUSTANG

1. Open the luggage compartment door and remove the lock cylinder retainer located behind the latch (Fig. 39).

2. Pull the lock cylinder, pad, and extension from the back panel.

3. Transfer the extension and spring to the new lock cylinder.

4. Position the lock cylinder, pad, and extension to the back panel and latch (Fig. 39) and install the retainer.

LUGGAGE COMPARTMENT LOCK CYLINDER—FALCON, MERCURY INTERMEDIATE AND COUGAR

1. Open the luggage compartment door and depress the lock cylinder release pin (Fig. 38) and pull the lock cylinder from the sleeve and cover.

2. Remove the extension and seal from the lock cylinder.

3. Install the extension and seal on the lock cylinder.

4. Insert the lock cylinder and extension into the sleeve and cover, making sure the extension is inserted into the slot of the latch (Fig. 38).

LUGGAGE COMPARTMENT LATCH—FALCON, MERCURY INTERMEDIATE AND COUGAR

REMOVAL

1. Open the luggage compartment door.

2. Depress the lock cylinder release pin (Fig. 38) with a piece of wire and pull the lock cylinder extension, and seal from the sleeve and cover.

3. Remove three latch assembly attaching screws and remove the latch.

INSTALLATION

1. Position the latch to the luggage compartment door and install the three attaching screws (Fig. 38).

2. Insert the lock cylinder, seal, and lock cylinder extension in the sleeve and cover. **Be sure the lock cylinder extension is inserted in the slot of the latch.**

3. Adjust the luggage compartment latch (Section 1).

LUGGAGE COMPARTMENT LATCH—FAIRLANE AND MUSTANG

1. Open the luggage compartment door and remove the lock cylinder retainer located behind the latch (Fig. 39).

2. Pull the lock cylinder, pad, and extension from the back panel.

3. Remove three screws attaching the latch to the inner panel and remove the latch from the vehicle.

4. Position the latch to the inner panel and install the three attaching screws snug.

5. Position the lock cylinder, pad, and extension to the back panel and latch (Fig. 39) and install the retainer.

6. Adjust the latch up and down for a tight luggage compartment seal and tighten the three attaching bolts.

Trim, Seats, And Convertible Top

GROUP 18

PART 18-1—*Interior Trim And Roof Outside Cover*

1 DOOR AND QUARTER TRIM PANELS

FALCON, FAIRLANE, MERCURY INTERMEDIATE DOOR TRIM PANEL

REMOVAL

1. Remove the two retaining screws from the arm rest and pad assembly and remove the assembly (Fig. 1).

2. Remove the one retaining screw from the inside door handle and window regulator handle (if so equipped) and remove the handles from their shafts.

3. Remove the two retaining screws from the mirror remote control and remove the control from the trim panel and disconnect the wires from the control.

4. With a putty knife, pry the trim panel retaining clips out of the inner panel at each side.

5. Bow the trim panel out of the trim panel retainers, and carefully loosen the water shields if necessary.

6. If the vehicle is equipped with power windows, disconnect the switch assembly wiring at the block connector after the trim panel is removed. Remove the two retaining screws and retainer plate from the switch assembly and remove the switch assembly.

INSTALLATION

1. Place a daub of sealer over each trim retaining clip hole to seal the retaining clips when they are pushed into the door. Also, apply sealer around the window regulator shaft and other existing holes.

2. Fasten the water shield to the inner panel (Fig. 2 and 3).

3. Make sure that all the retaining clips are installed in the trim panel.

4. Position the power window switch assembly to the trim panel (if so equipped). Install the retainer plate and the two retaining screws. Connect the switch assembly wiring at the block connector.

5. Position the upper edge of the trim panel in the upper trim panel retainer. Bow the trim panel, and then insert the lower edge into the lower retainer. Push the retaining clips into the holes in the door inner panel.

6. Connect the remote control mirror wires to the remote control and position the control to the trim panel. Secure the mirror control to the trim panel by installing the two retaining screws.

7. Position the inside door handle and window regulator handle on their respective shafts and install the retaining screws.

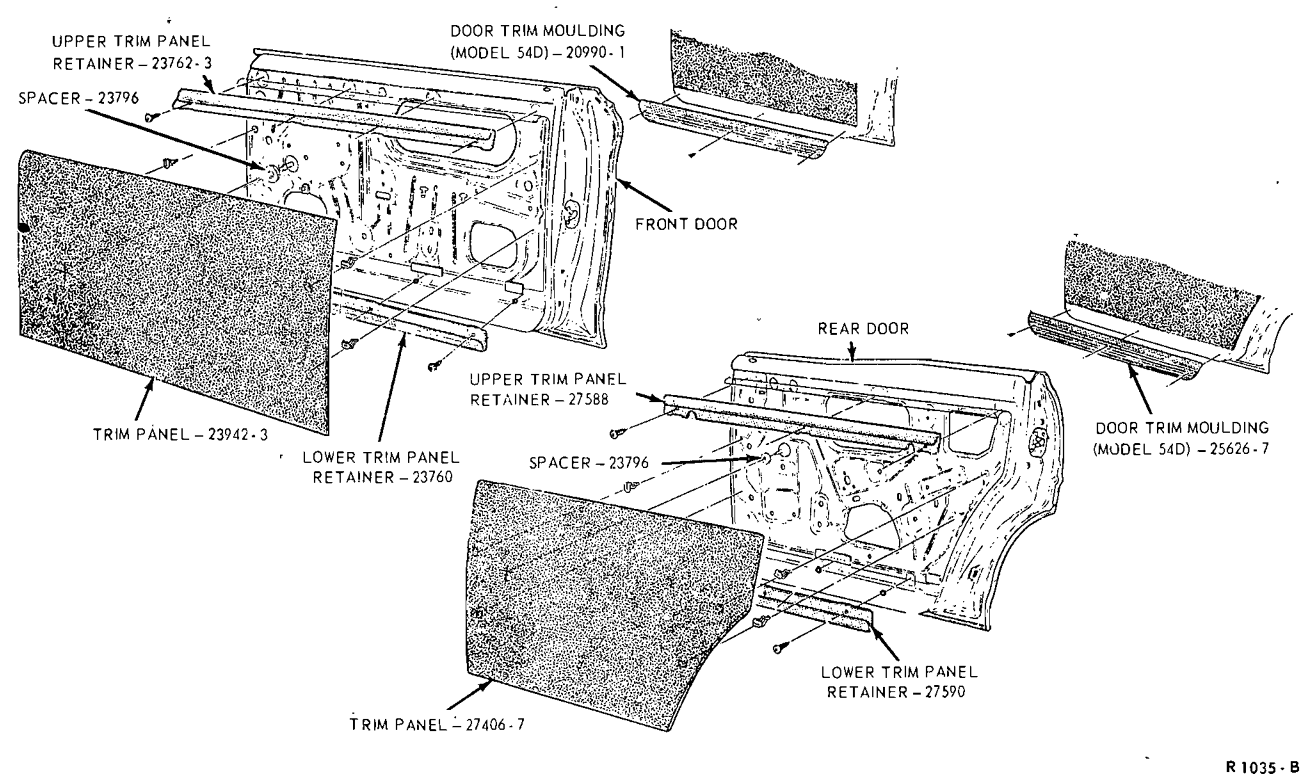


FIG. 1—Typical Door Trim Panel Installation

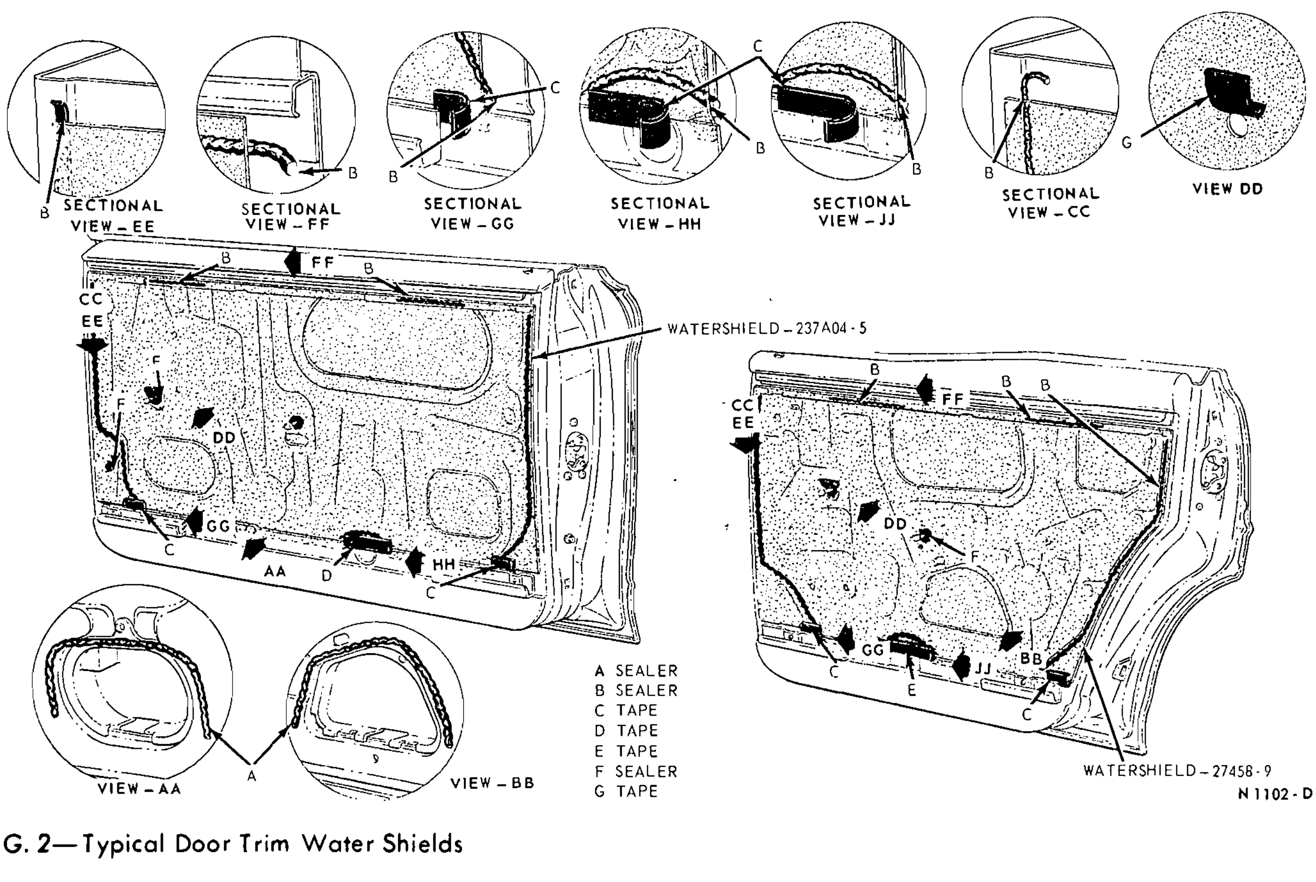


FIG. 2—Typical Door Trim Water Shields

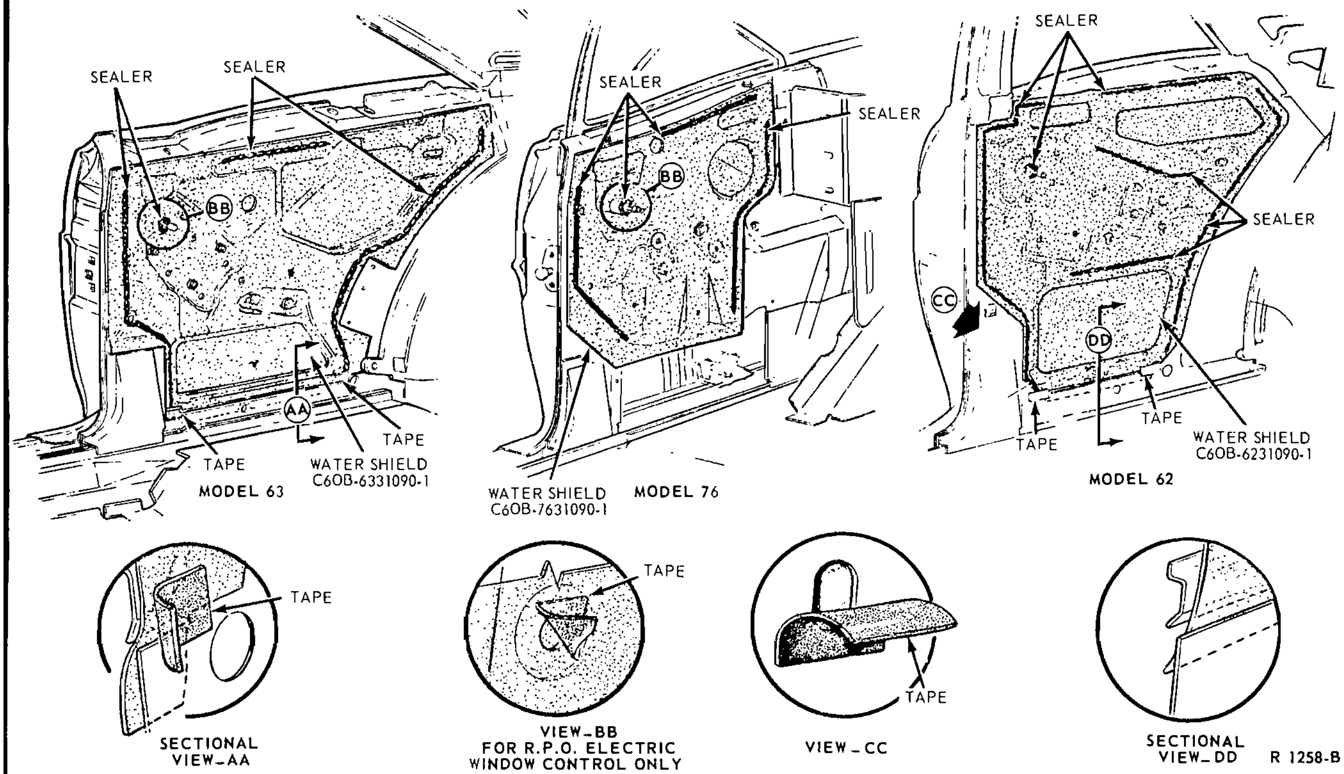


FIG. 3—Typical Quarter Trim Water Shields

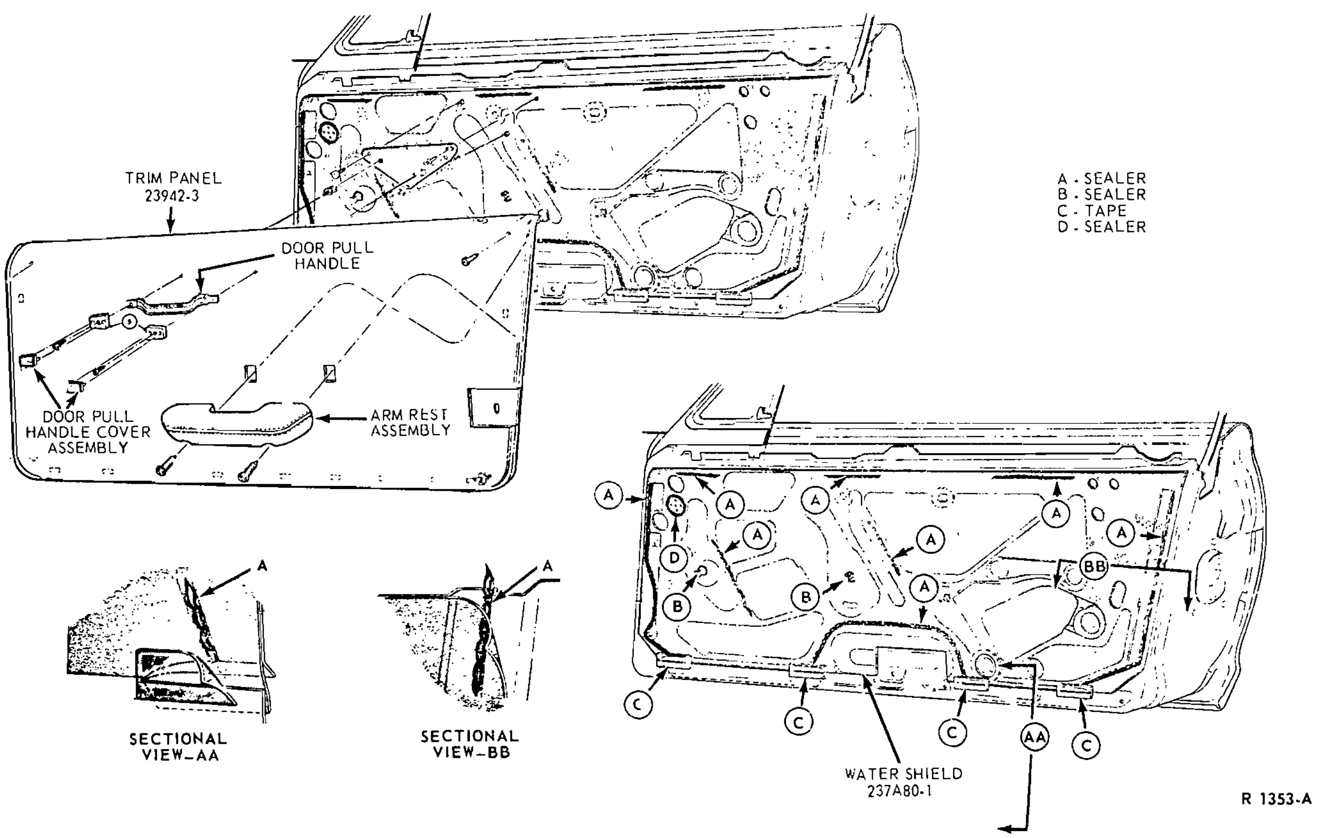


FIG. 4—Typical Door Trim Panel and Water Shield Installation—Cougar

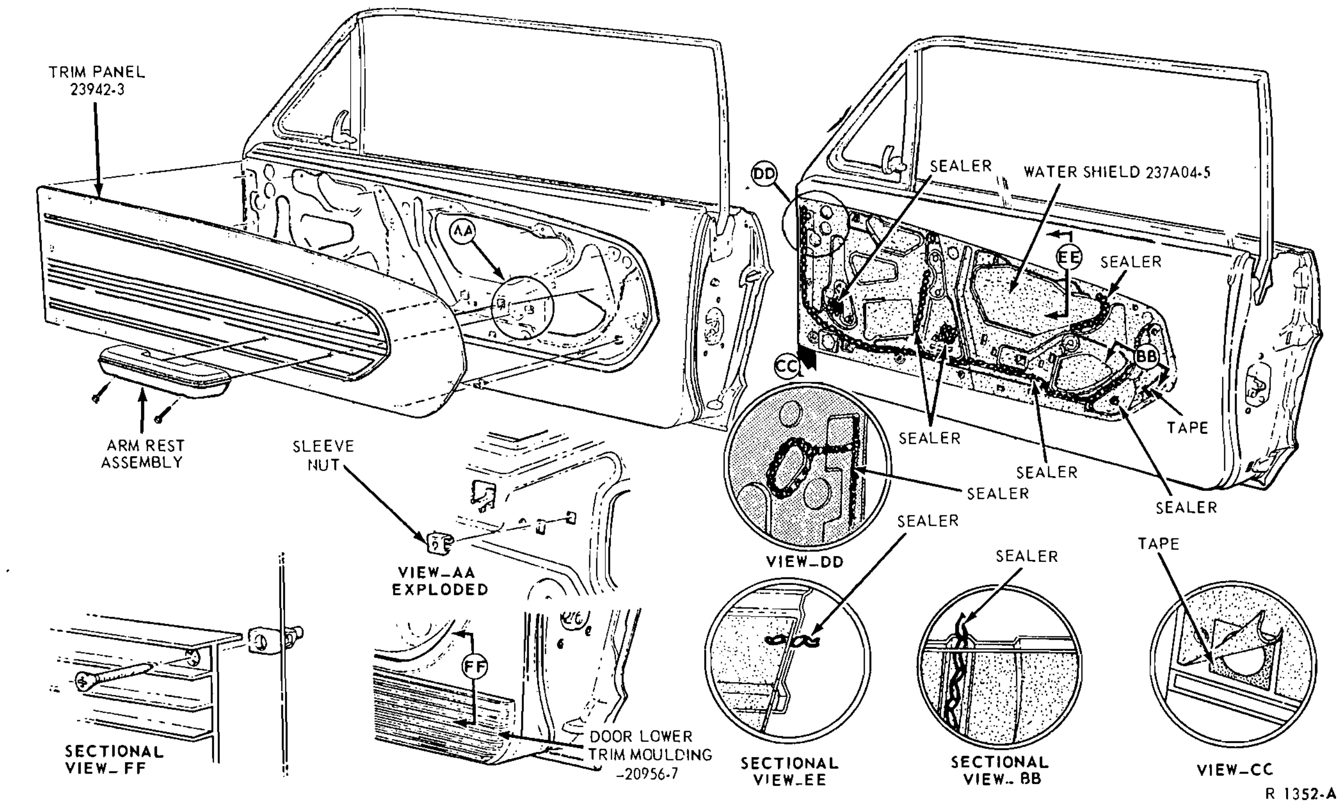


FIG. 5—Typical Door Trim Panel and Water Shield—Mustang

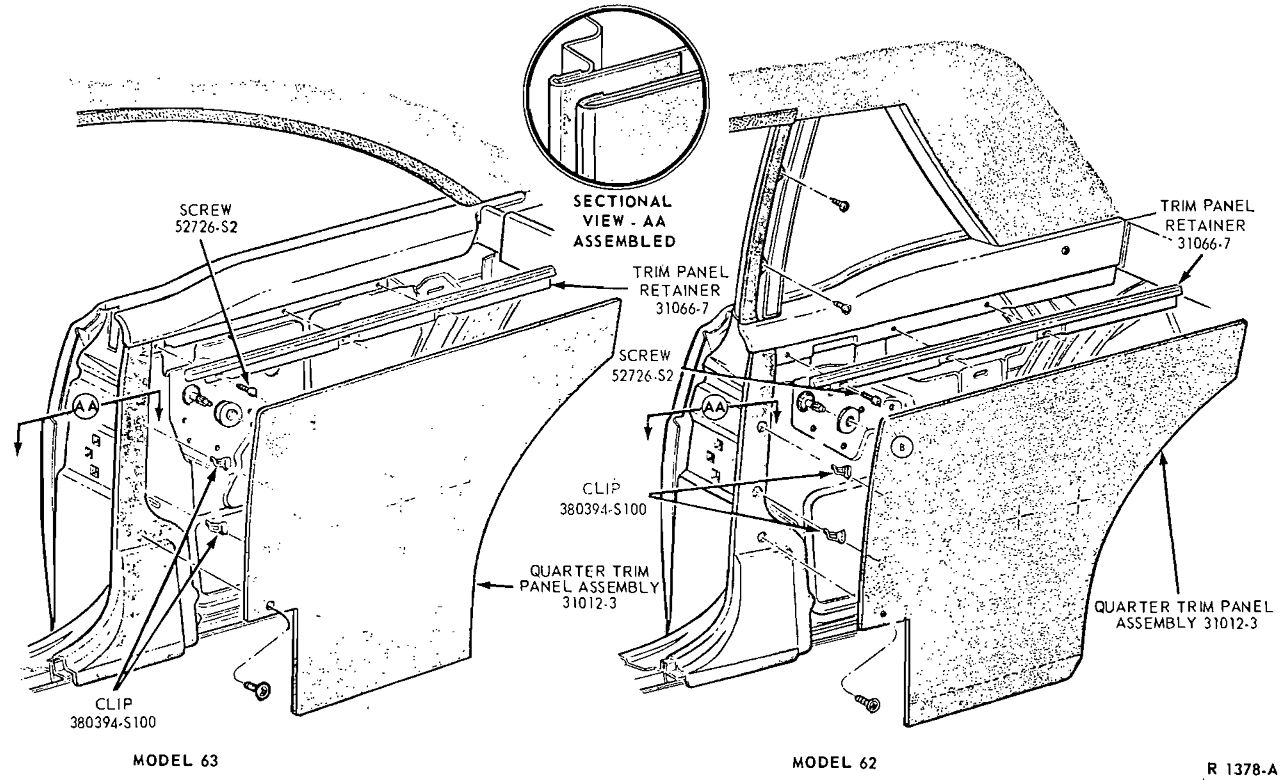


FIG. 6—Quarter Trim Panel—Falcon, Fairlane, Mercury Intermediate

8. Position the arm rest and pad assembly to the panel and install the two retaining screws.

COUGAR DOOR TRIM PANEL

REMOVAL

1. Remove the retaining screws from the window regulator handle and the inside door handle and remove the handles from their shafts (Fig. 4).
2. Remove the two retaining screws from the arm rest assembly and remove the assembly.
3. Pry the two door pull handle cover assemblies from the handle and remove the two retaining screws from the handle and remove the pull handle.
4. With a putty knife, pry the trim panel retaining clips out of the inner panel and remove the panel from the door. Carefully remove the water shield, if necessary.

INSTALLATION

1. Place a daub of sealer over each trim retaining clip hole to seal the retaining clips when they are pushed into the door. Also, apply sealer around the window regulator shaft hole and other existing holes.
2. Fasten the water shield to the inner panel (Fig. 4).
3. Position the trim panel to the inner door panel and water shield and push the retaining clips into their holes.
4. Position the arm rest assembly and install the two retaining screws.
5. Position the inside door handle and window regulator on their respective shafts and install the retaining screws.

MUSTANG DOOR TRIM PANEL

REMOVAL

1. Remove the retaining screws from the window regulator handle and the inside door handle and remove the handles from their shafts (Fig. 5).

2. Remove the two retaining screws from the arm rest assembly and remove the assembly.

3. With a putty knife, pry the trim panel retaining clips out of the inner panel and remove the panel

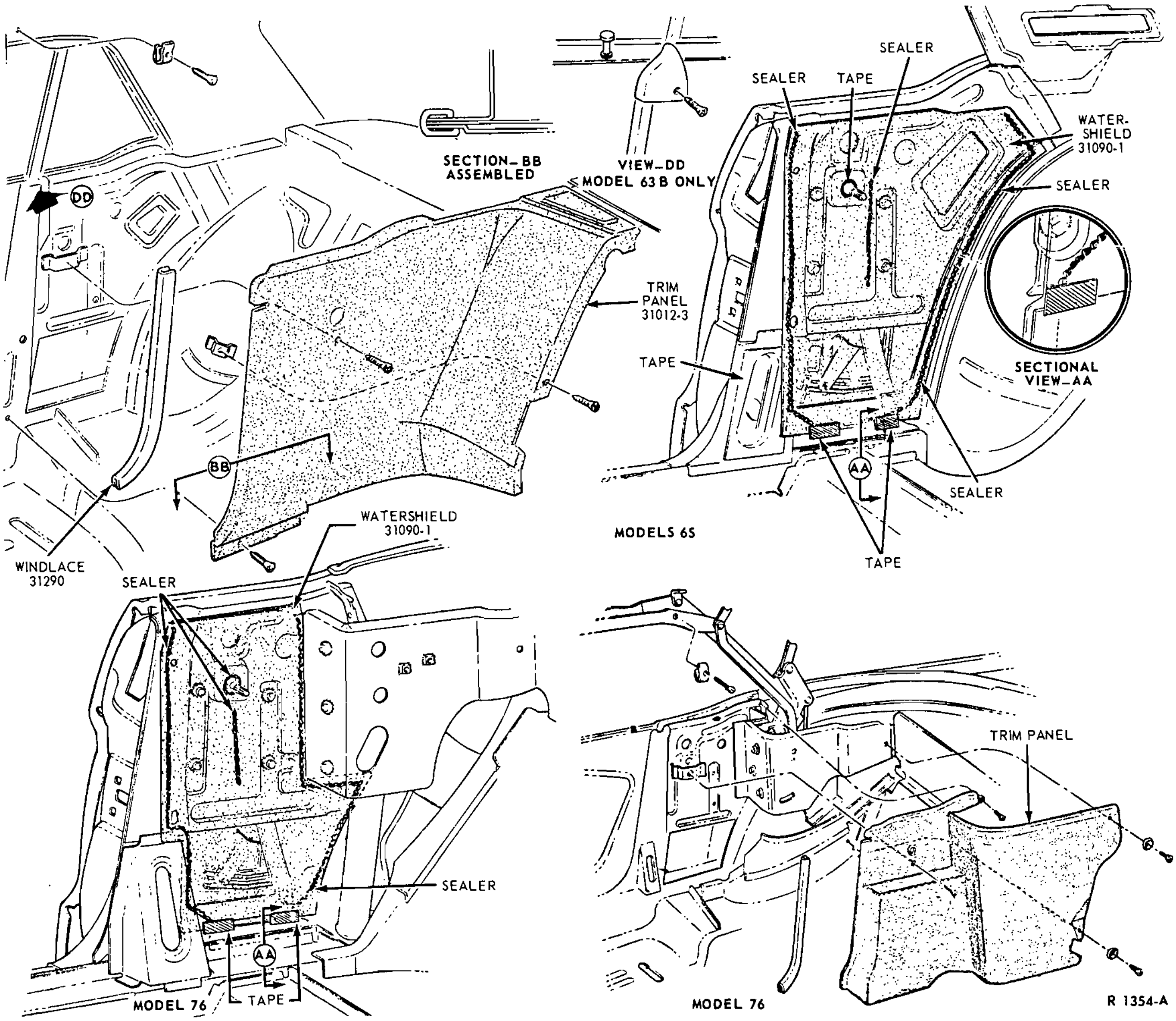


FIG. 7—Quarter Trim Panel and Water Shield—Mustang

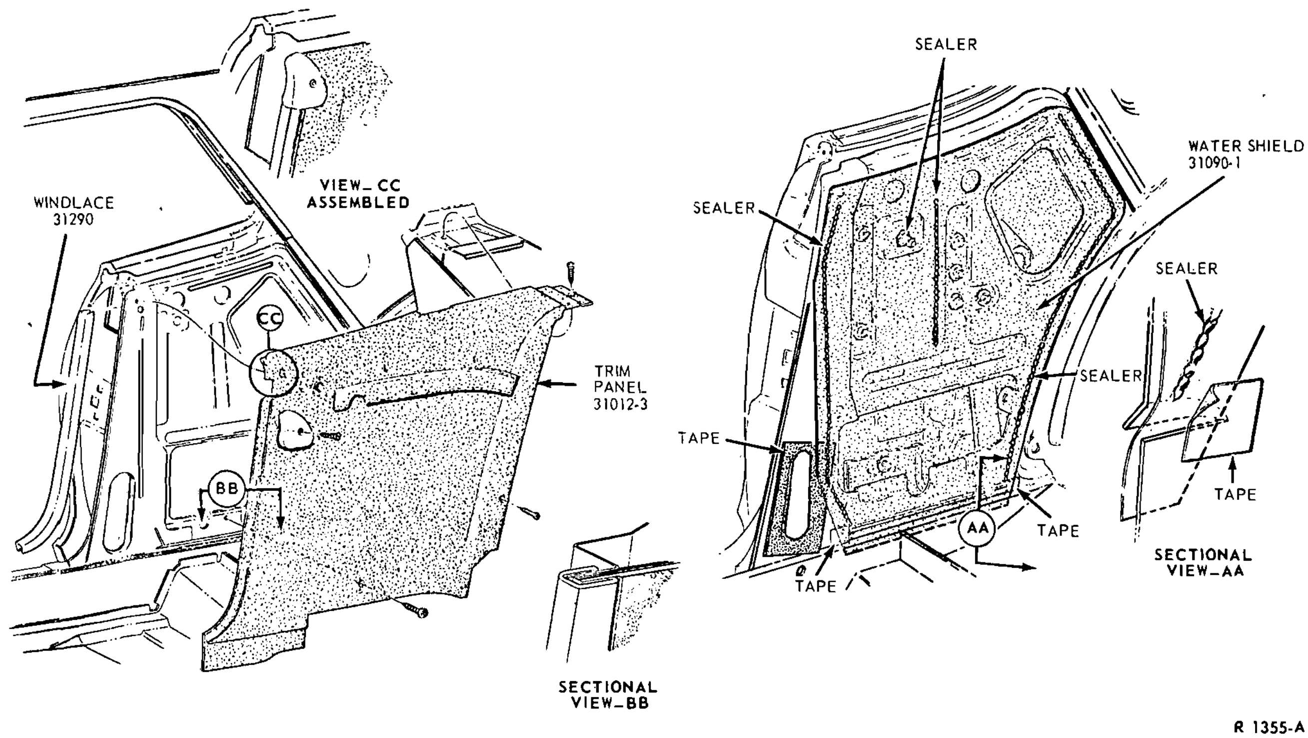


FIG. 8—Typical Quarter Trim Panel and Water Shield—Cougar

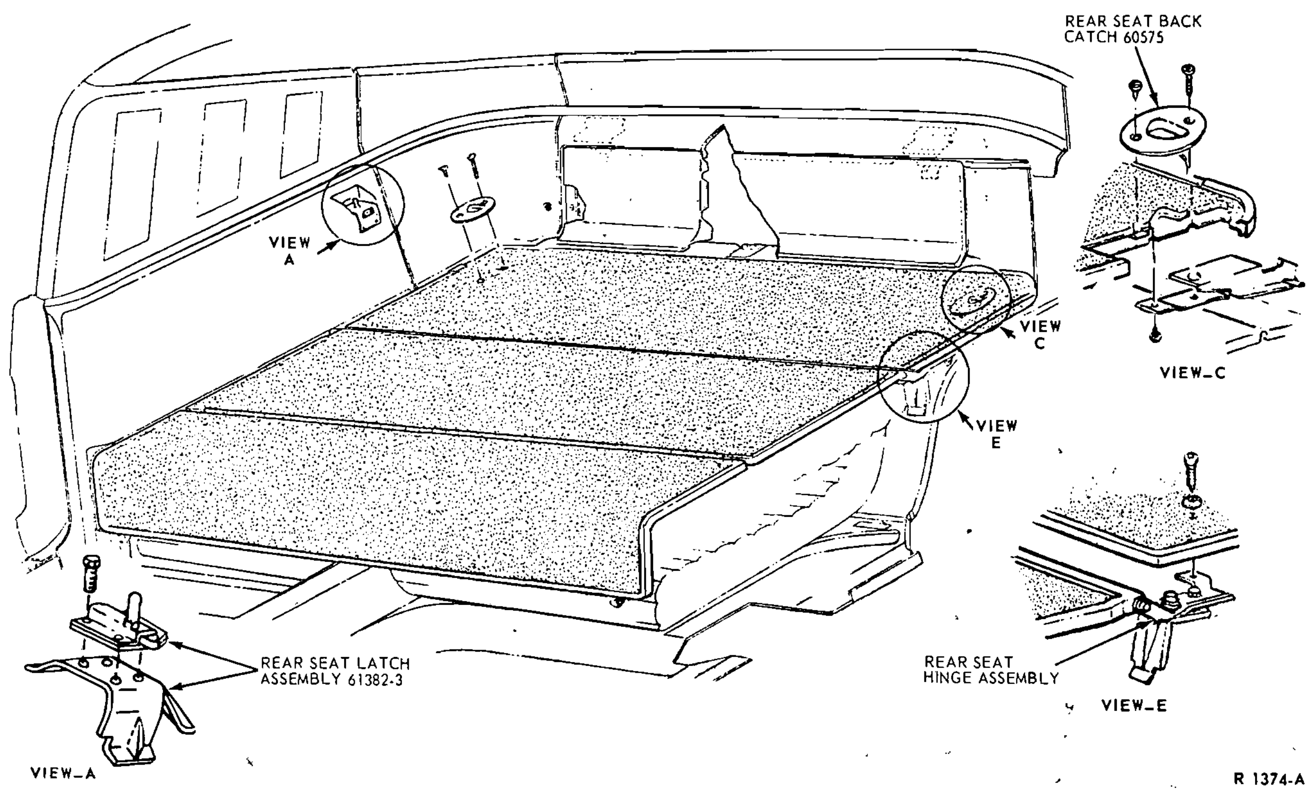


FIG. 9—Rear Seat and Auxiliary Floor—Model 63—Mustang

from the door. Carefully remove the water shield, if necessary.

INSTALLATION

1. Place a daub of sealer over each trim retaining clip hole to seal the retaining clips when they are pushed into the door. Also, apply sealer around the window regulator shaft hole and other existing holes.

2. Fasten the water shield to the inner panel (Fig. 5).

3. Be sure that the retaining clips are installed in the trim panel.

4. Position the trim panel to the inner door panel and water shield and push the retaining clips into their holes.

5. Position the arm rest assembly to the trim panel and install the two retaining screws.

6. Place the window regulator handle and inside door handle on their respective shafts and install a retaining screw in each handle.

QUARTER TRIM PANEL—FALCON, FAIRLANE, MERCURY INTERMEDIATE

Basically, all quarter trim panels are retained in the same manner. In view of this, one removal and installation procedure will cover all models.

1. Remove the window regulator handle and the arm rest retaining screws and remove the handles from their shafts.

2. Remove any screws retaining the trim panel to the inner panel, such as the arm rest retaining screws (Fig. 6).

3. With a putty knife, pry the trim panel retaining clips out of the inner panel at each side.

4. Bow the trim panel out of the retainers, and carefully loosen the water shield, if necessary.

5. Place a daub of sealer over each trim retaining clip hole to seal the retaining clips when they are pushed into the door. Also, apply this sealer around the window regulator shaft and other existing holes.

6. Fasten the water shield to the inner panel.

7. Make sure that all the retaining clips are installed in the trim panel. Place the upper edge of the trim panel in the retainer, bow the trim panel, and then insert the lower edge into the retainer. Push the retaining clips into the holes in the door inner panel (Fig. 6).

8. Install the arm rest retaining screws.

9. Place the friction plate against the trim panel and push the handle onto the shaft. Install the handle retaining screws.

COUGAR AND MUSTANG HARDTOP AND CONVERTIBLE QUARTER TRIM PANEL

REMOVAL

1. Remove the rear seat cushion and the rear seat back (Refer to Part 2, Section 1).

2. Remove the retaining screw from the upper front trim panel cap and remove the cap, if so equipped.

3. Pull the windlace assembly from the door edge of the quarter trim panel.

4. Remove the retaining screw from the quarter window regulator handle and remove the handle from the shaft.

5. Remove the retaining screws from the trim panel and remove the panel from the inner quarter panel.

6. Carefully remove the water shield, if necessary.

INSTALLATION

1. Place a daub of sealer over each of the retaining screw holes to seal the screw when it is installed. Also, apply sealer around the window regulator shaft hole.

2. Fasten the water shield to the inner quarter panel (Fig. 7 and 8).

3. Position the trim panel to the inner panel and install the retaining screws.

4. Position the window regulator handle on the shaft and install the retaining screw.

5. Press the windlace assembly into position along the door edge of the trim panel.

6. Position and install the upper trim panel cap and retaining screw, if so equipped.

7. Install the rear seat back and rear seat cushion.

QUARTER TRIM PANELS—MODEL 63—MUSTANG

REMOVAL

1. Remove the rear seat cushion.

2. Tilt the rear seat back forward and remove the retaining screws from the rear floor section and remove the floor section (Fig. 9).

3. Remove the two retaining bolts from the rear seat back hinges and remove the seat back assembly.

4. Remove the four retaining screws from the upper front quarter trim moulding and remove the moulding (Fig. 10).

5. Remove the seven retaining screws from the upper front quarter trim panel and remove the panel.

6. Remove the four screws retaining the rear seat latch assembly at the lower quarter panel and remove the latch assembly.

7. Remove the four bolts and two screws from the lower front quarter trim panel.

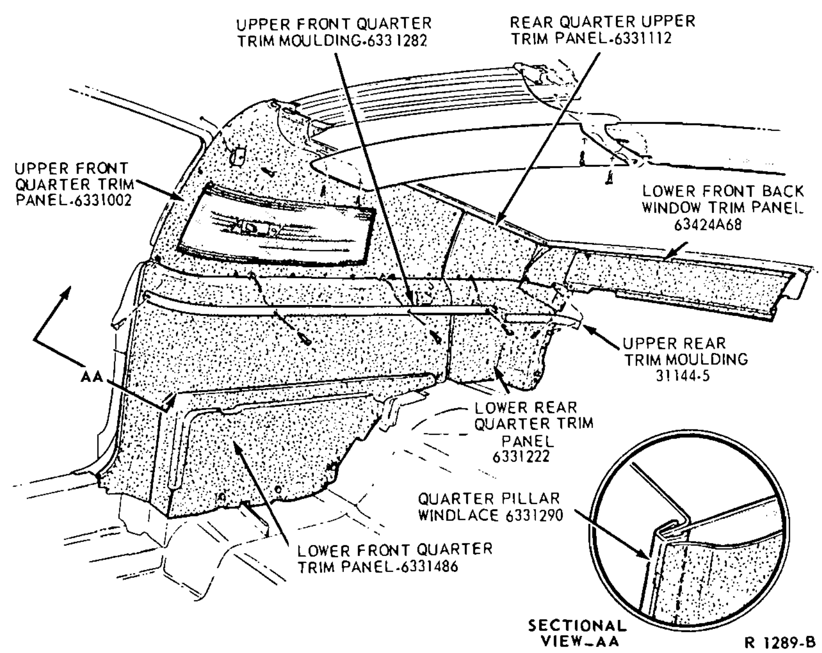


FIG. 10—Interior Moulding and Quarter Trim Panel Installation—Mustang Model 63

8. Remove the carpet trim from the trim panel and disconnect the plug connectors to the courtesy light in the trim panel and remove the panel and remove the light from the panel.

INSTALLATION

1. Install the courtesy light in the lower front quarter trim panel and connect the plug connectors.

2. Position the trim panel to the lower quarter panel and install the retaining bolts and screws. Install the carpet trim on the trim panel.

3. Position the upper front quarter trim panel and install the retaining screws.

4. Position the rear seat latch assembly and install the four retaining screws.

5. Install the upper front quarter trim moulding and retaining screws.

6. Position the rear seat back assembly and hinges and install the two retaining bolts in each of the hinges.

7. Position the rear floor section and install the retaining screws.

8. Tilt the rear seat back assembly rearward and install the rear seat back and seat cushion.

2 HEADLINING

FALCON—FAIRLANE—MERCURY INTERMEDIATE

REMOVAL

1. Remove the sun visors and rear view mirror.
2. Remove the windshield side and upper garnish mouldings.
3. Pull the door opening weatherstrips down far enough to provide access to the headlining perimeter.
4. Remove the rear seat cushion and seat back.
5. Remove the quarter trim panels.
6. Remove the rear package tray trim panel.

7. Remove the coat hooks and the dome light lens assemblies.

8. Unhook the headlinging from the rear quarter retaining strips.

9. Cut the headlining loose around the back window.

10. Peel the headling from around the windshield and door openings (Figs. 11, 12 and 13).

11. Unhook the headlining support rods and remove the headlining assembly from the car..

INSTALLATION

1. Unpack and lay out the new headlining.

2. Transfer the support rods from the old headlining to the new one.
3. Position the headlining in the car and insert the support rod ends into their respective retaining holes in the roof side rails.
4. Measure and trim excess material from the headlining around the back window.
5. Apply trim cement around the back window flange and around the mating headlining edge. Tuck the headlining under the back window weatherstrip and pull out any wrinkles.
6. Apply trim cement around the rear quarter area and to the mating surface of the headlining. Hook the

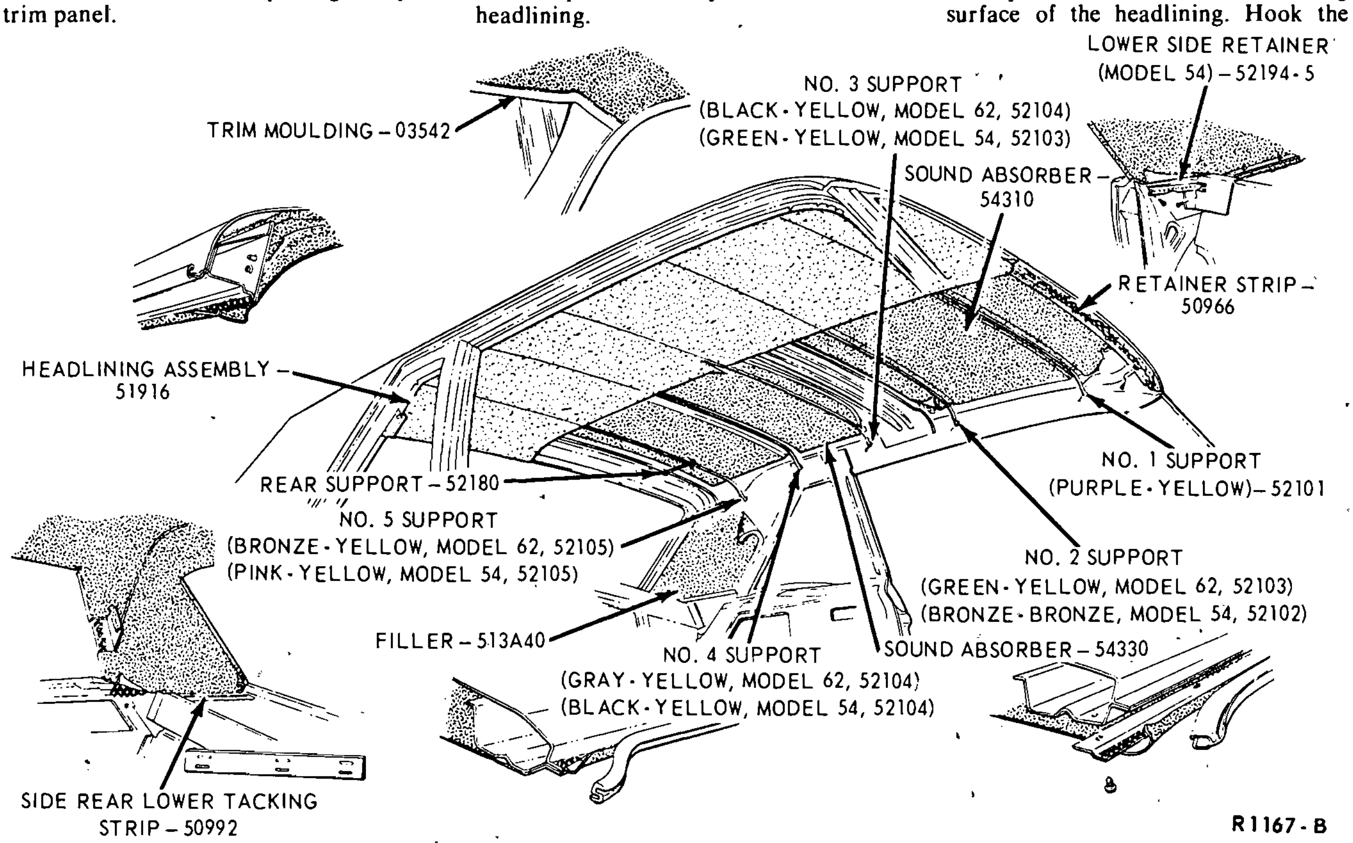


FIG. 11—Headlining Installation—Typical Mercury Intermediate, Falcon, Fairlane

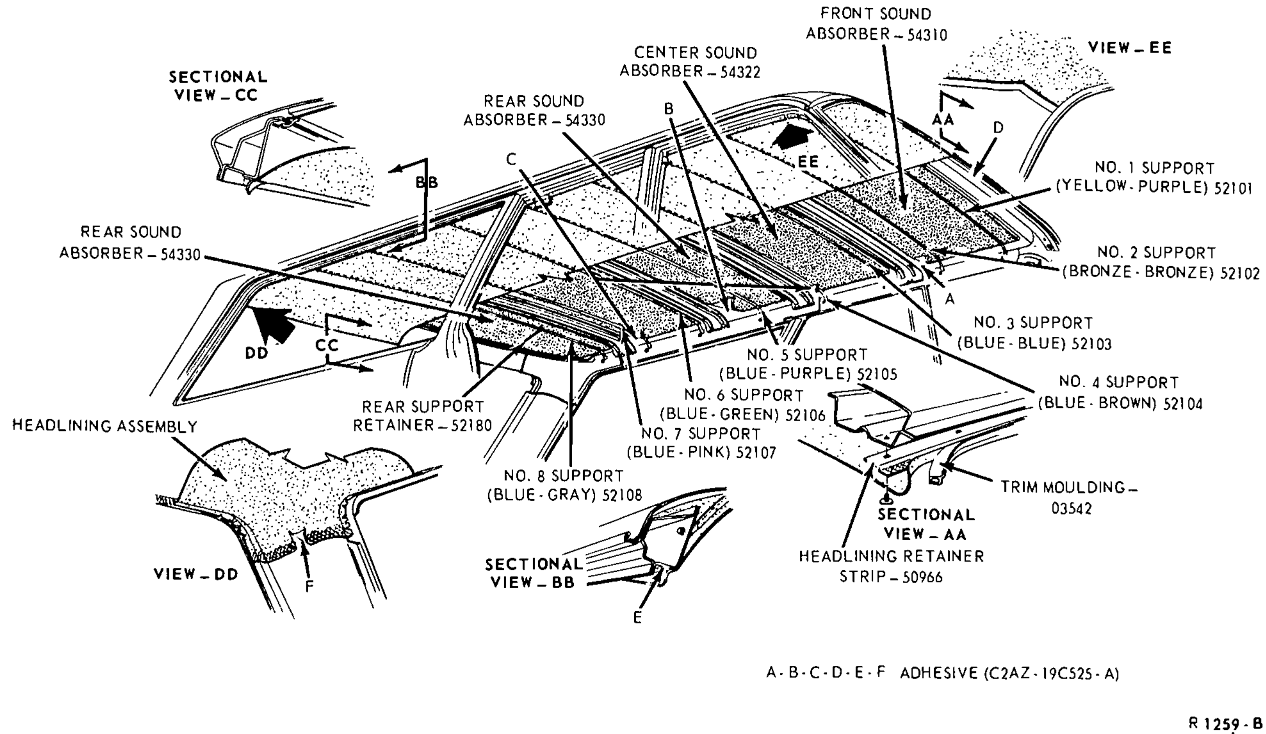


FIG. 12—Headlining Installation—Typical Station Wagon

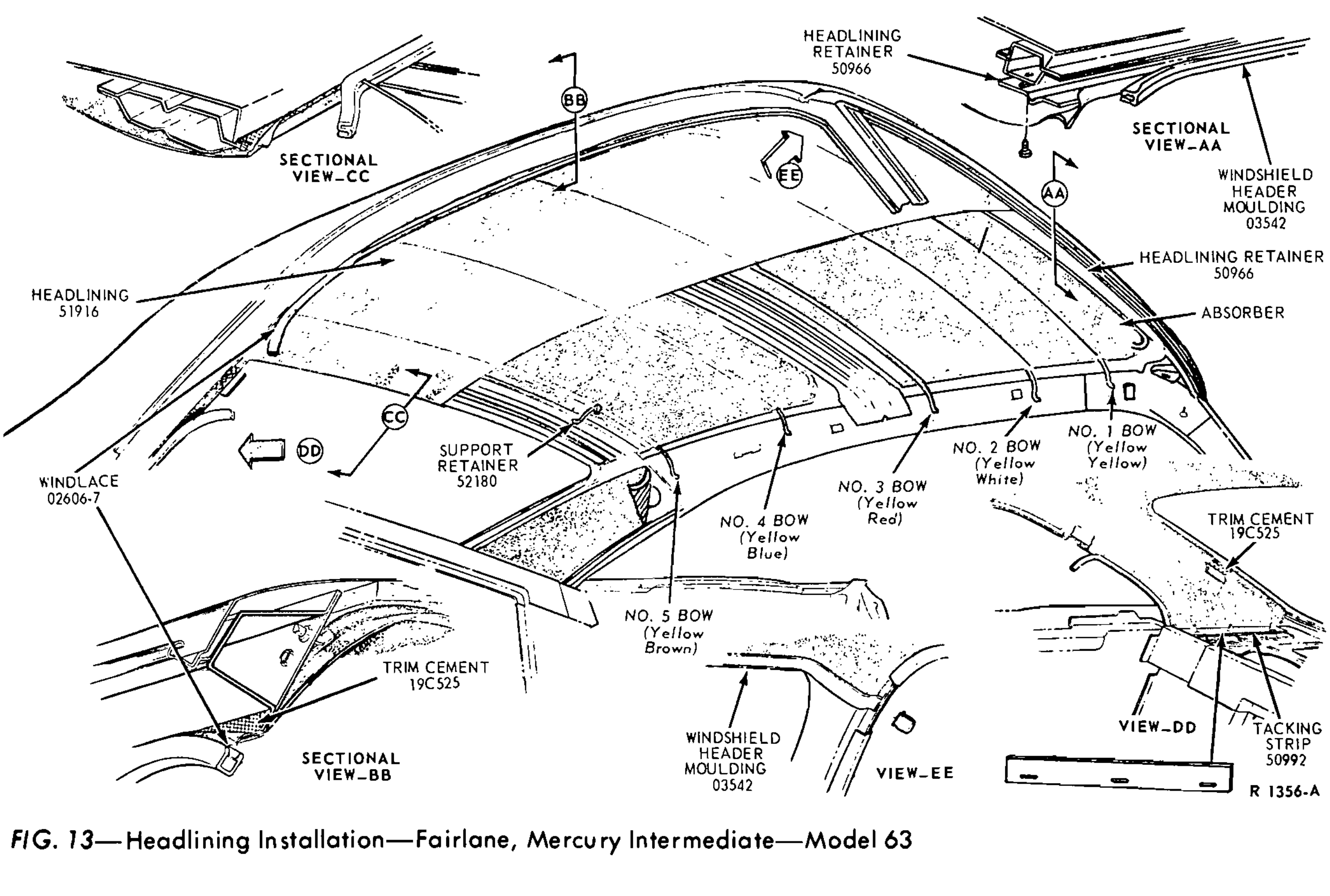


FIG. 13—Headlining Installation—Fairlane, Mercury Intermediate—Model 63

headlining material over the retaining strips and bend the retainer tabs down.

7. Apply trim cement to the roof header and to the mating surface around the front of the headlining.

8. Position the headlining to the roof header and pull out any wrinkles.

9. Apply trim cement around the door openings and mating surface of the headlining. Steam between the headlining panels as required to help remove any wrinkles and secure the headlining perimeter.

10. Trim the excess headlining material.

11. Install the package tray and quarter trim panels.

12. Install the coat hooks and dome light lens.

13. Install the windshield upper and side interior mouldings.

14. Install the windlace around the door openings.

15. Install the rear view mirror and sun visors.

16. Install the rear seat back and rear seat cushion.

17. Clean the interior and headlining.

MUSTANG (MODEL 63)

1. Remove the sun visors and the inside rear view mirror.

2. Remove the roof headlining side front retainer from each A pillar (Fig. 14—View BB).

3. Remove 5 screws and remove the back window upper garnish moulding.

4. Remove 4 screws and remove the quarter trim upper front mouldings and caps (Fig. 10).

5. Remove 5 screws and remove the quarter trim upper front panel.

6. Remove the windlace from the door openings (Fig. 14).

7. Cut the headlining at the windshield weatherstrip and loosen the headlining.

8. Cut the headlining at the back window weatherstrip and loosen the headlining.

9. Pull the headlining from the door opening pinch weld, disconnect the bows, and remove the headlining.

10. Place the old and new headlinings on a clean surface and transfer the bows to the new headlining. The bows are color coded on one end for identification (Fig. 14).

11. Position the headlining in the car and install the roof bows in the side rails.

12. Apply trim cement (C2AZ-19C525-A) to the back side of the headlining at the back window opening.

13. Tuck the headling under the back window weatherstrip. Smooth out any wrinkles or gathering and trim off any excess material.

14. Apply trim cement (C2AZ-19C525-A) to the back side of the headlining at the windshield opening.

15. Tuck the headlining under the windshield weatherstrip. Smooth out any wrinkles or gathering and trim off any excess material.

16. Apply trim cement (C2AZ-19C525-A) to the roof side rails at the door openings. Position the headlining to the side rails and trim off any excess material (Fig. 14).

17. Install the windlace in the door openings.

18. Install the roof headlining side front retainer at each A pillar.

19. Install the inside rear view mirror and sun visors.

20. Install the right and left quarter trim upper front panels (Fig. 10).

21. Install the quarter trim upper front mouldings and front caps.

22. Install the back window upper garnish moulding.

23. Clean all mouldings and remove any headlining scraps from the car.

MUSTANG AND COUGAR (MODEL 65)

The procedure for the Cougar and Mustang is the same except for lights

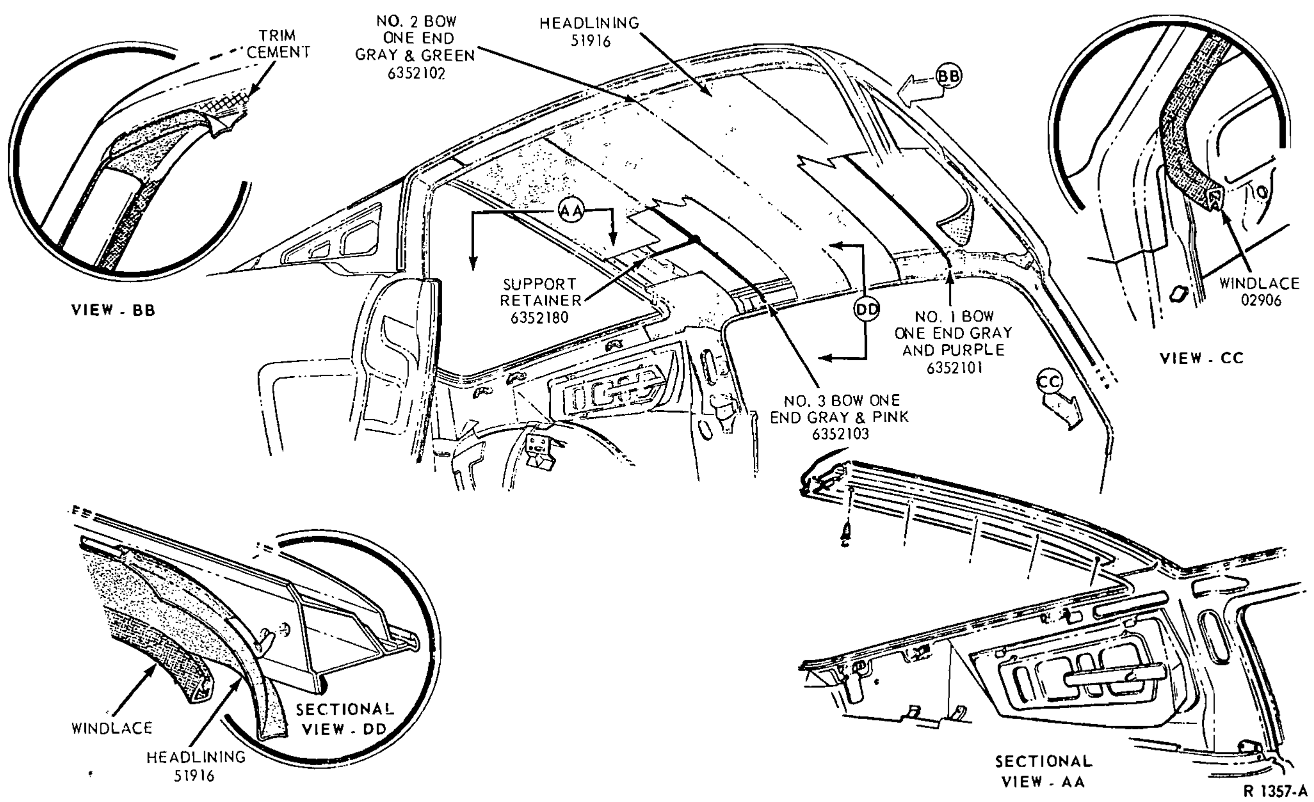


FIG. 14—Headlining Installation—Mustang Model 63

in the roof quarters on the Cougar models.

1. Remove the rear seat cushion and seat back and remove the quarter trim panels.

2. Remove 2 clips and retainers and remove the package tray.

3. Bend back the headlining lower rear side retaining strip tabs (Fig. 15).

4. Remove the coat hanger hooks.

5. Remove the sun visors.

6. Remove the headlining retainer from each A pillar (Fig. 15).

7. Remove 3 screws and remove the rear view mirror.

8. Remove the door opening windlace from each side of the body.

9. Cut the headlining along the edge of the windshield and back window weatherstrips.

10. Remove the headlining from the right and left sides in the package tray area. Then, remove the headlining from the roof side rails and remove it from the car.

11. Place the new and old headlining on a clean surface and transfer the headlining support wires in sequence to the new headlining. **The roof bows are color coded on one end. When ordering new roof bows, be sure to note the color code.**

12. Position the headlining in the car and install the rear support wire and 2 rear support retainers. Then, install the remaining support wires, working towards the front of the car.

13. Trim the headlining at the windshield header, leaving approximately 1/2 inch of material for tucking under the windshield header weatherstrip.

14. Apply trim cement to the windshield header and, starting from the center, cement the headlining to the header. Insert the remaining headlining material under the windshield header weatherstrip.

15. Trim the headlining at the rear window, leaving approximately 1/2 inch of material for tucking under the weatherstrip. Apply trim cement to the rear window upper rail and, starting from the center, cement the headlining to the upper rail. Insert the remaining material under the rear window weatherstrip.

16. Pull the headlining down at the sides to remove wrinkles. Cut the listings at each end to eliminate gathering of the material.

17. Apply trim cement to the left roof side rail over the door and quarter window. Pull the headlining down to remove wrinkles and cement it in place. Then, trim the headlining as necessary. Cement and trim the right side the same way.

18. Straighten the metal prongs (View AA—Fig. 15) at the package tray area; attach the headlining to the prongs and bend the prongs down as shown.

19. Roll the lower rear side retaining strips into the headlining and retain them by bending the tabs (View AA).

20. Install the right and left roof side windlace at the door and window openings.

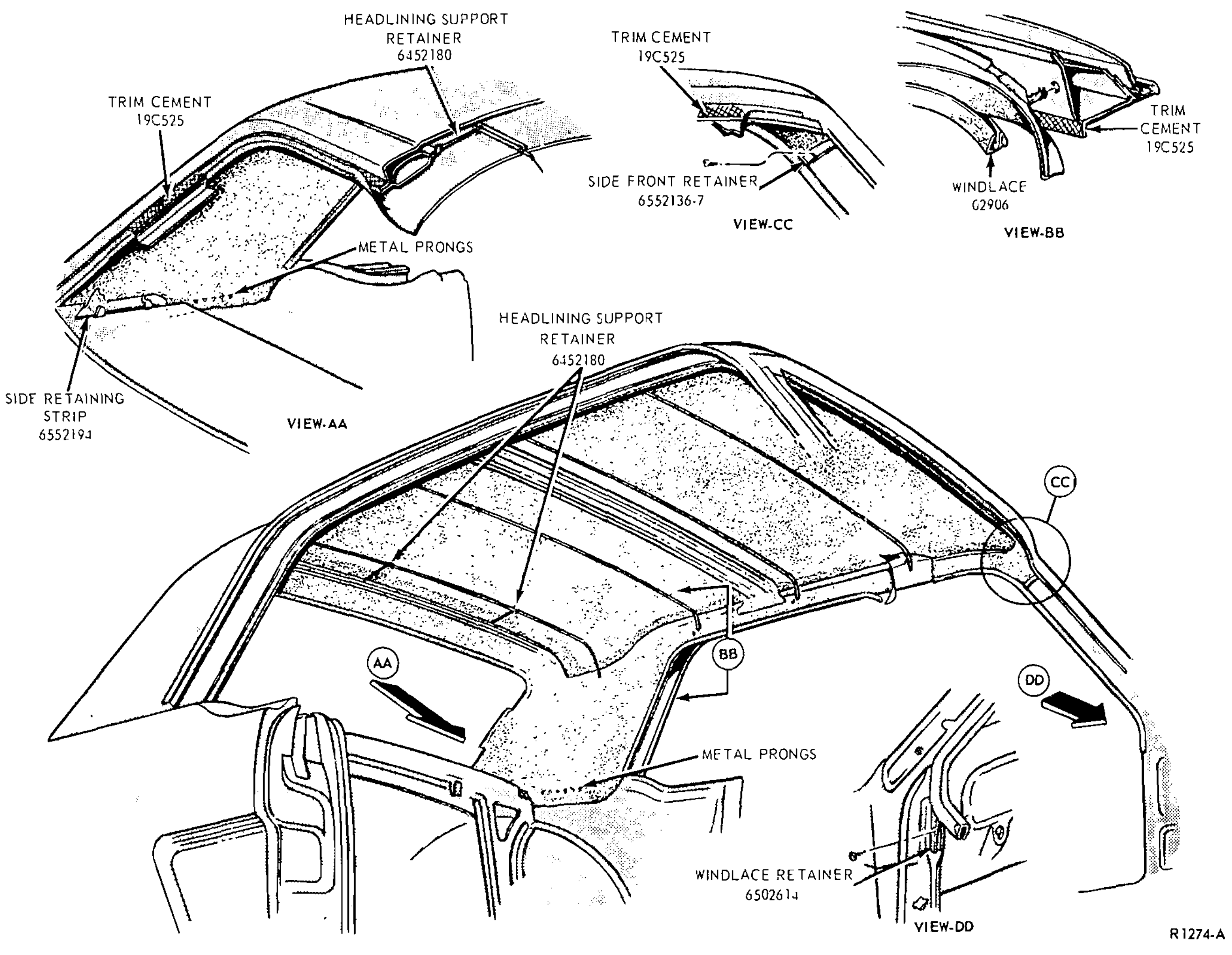


FIG. 15—Headlining Installation—Mustang Model 65

21. Install the headlining retainer at the A pillar (View DD).

22. Install the rear view mirror, sun visors, and coat hooks.

23. Slide the package tray into position and install the retainers and clips. Then, install the quarter trim panels and rear seat back and cushion.

3 INSTRUMENT PANEL PAD

FALCON, FAIRLANE, MERCURY INTERMEDIATE

REMOVAL

1. Open the glove box door. Remove the glove box liner retaining screws and remove the glove box liner.

2. Fairlane: Remove the radio control knobs and the control shaft retaining nuts.

3. Remove the instrument cluster retaining screws.

4. Pull the instrument cluster out far enough to disconnect the speedometer cable, light sockets and wiring connectors from the instrument cluster. Remove the instrument cluster.

5. Remove the nuts retaining the safety cover to the instrument panel.

6. Pry up and remove the safety cover.

INSTALLATION

1. Position the new safety cover to the instrument panel (Figs. 16 and 17).

2. Install the safety cover retaining nuts.

3. Position the instrument cluster to the instrument panel. Connect the wiring connectors and the speedometer cable. Install the light sockets.

4. Install the instrument cluster retaining screws.

5. Fairlane: Install the radio control shaft retaining nuts and the radio control knobs.

6. Position the glove box liner in place and install the glove box liner retaining screws.

COUGAR INSTRUMENT PANEL PAD

REMOVAL

1. Disconnect the battery ground cable.

2. Remove the thirteen (13) retaining screws from the front of the instrument panel pad assembly (Fig. 18).

3. Remove the four retaining screws from the heater control assembly and position the control out of the instrument panel. Thru the heater control opening, disconnect the speedometer cable.

4. Remove the three retaining screws from the ash receptacle and disconnect the connector to the cigar lighter. Remove the receptacle assembly from the instrument panel.

5. Thru the receptacle opening, remove the nut and washer retaining the inboard edge of the instrument cluster to the instrument panel.

6. Remove the seven retaining screws from the instrument cluster. Position the cluster out of the panel and disconnect the windshield wiper switch, the multiple connector and the push on connector to the constant voltage regulator and then remove the cluster.

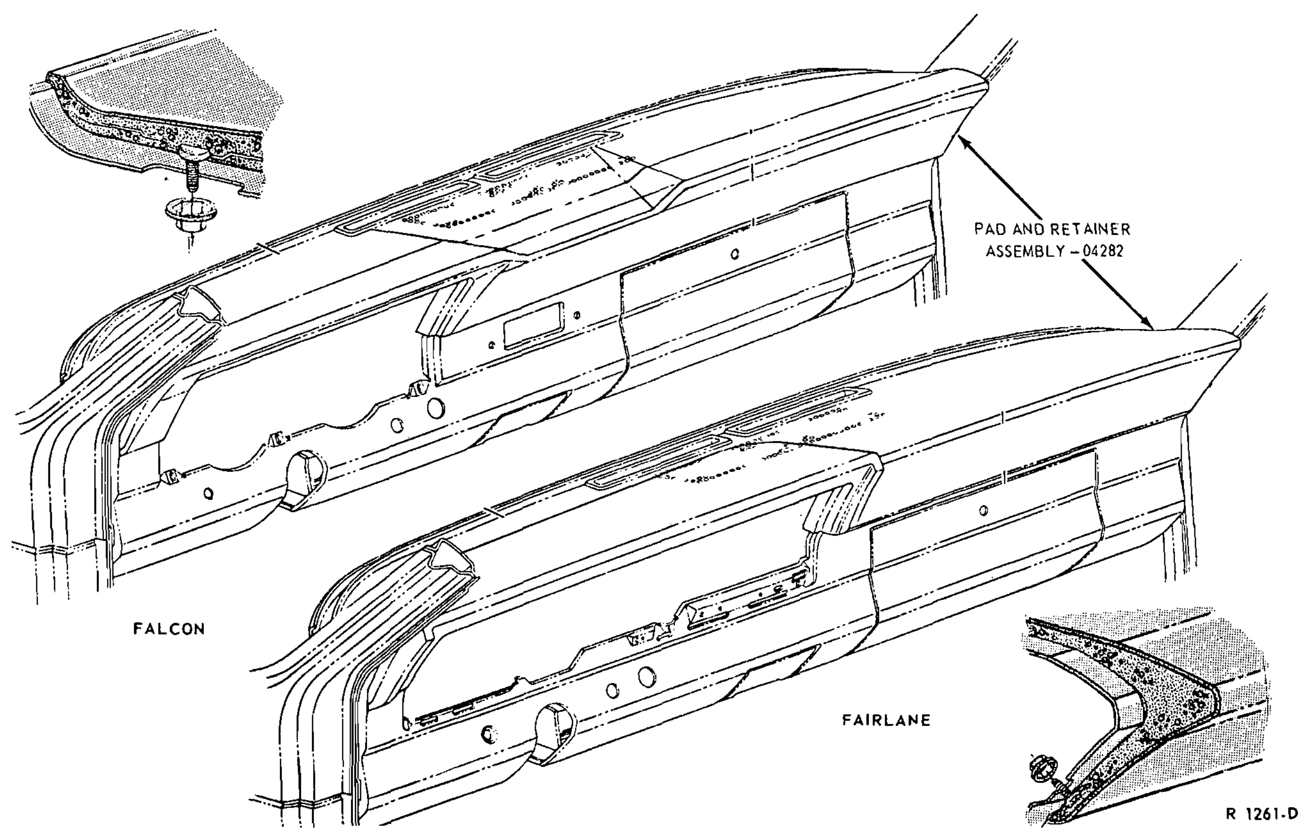


FIG. 16—Instrument Panel Pad Installation—Falcon, Fairlane

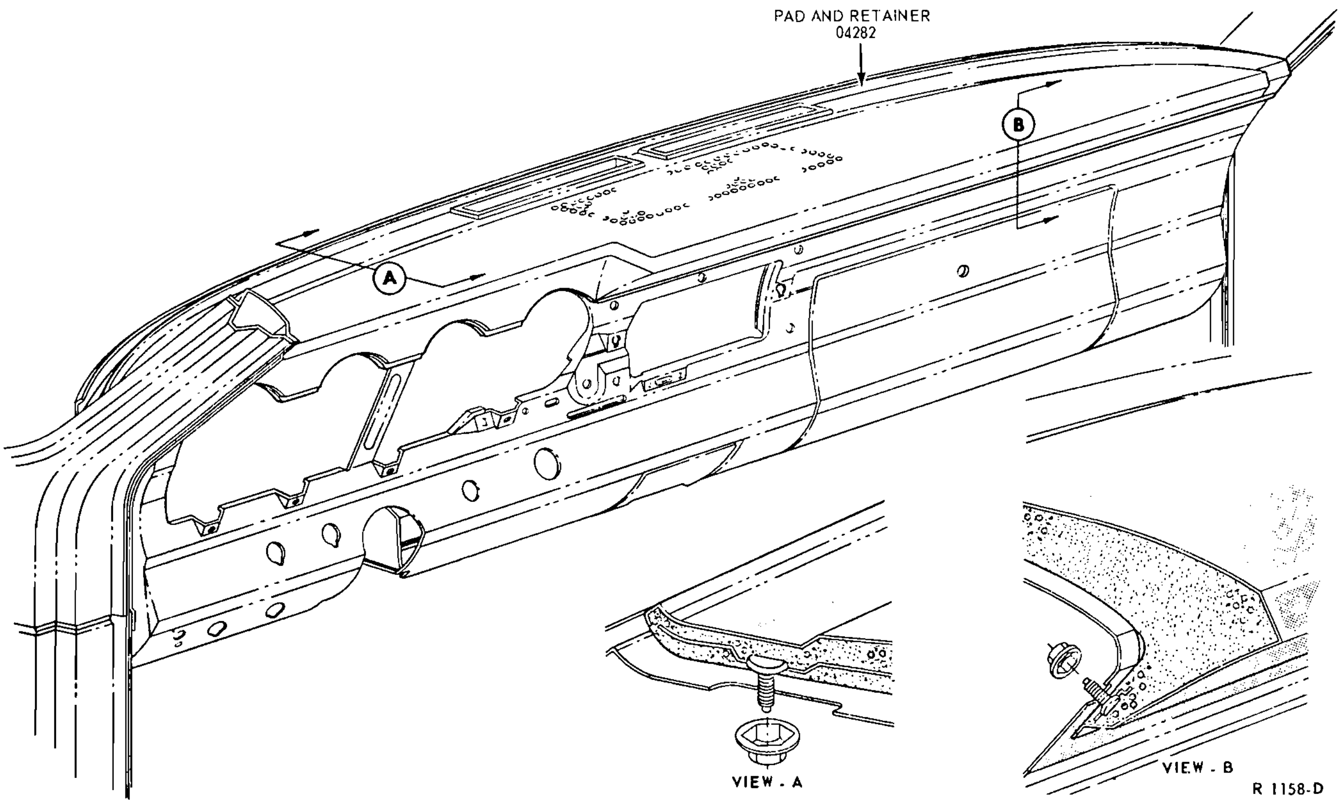


FIG. 17— Instrument Panel Pad Installation—Mercury Intermediate

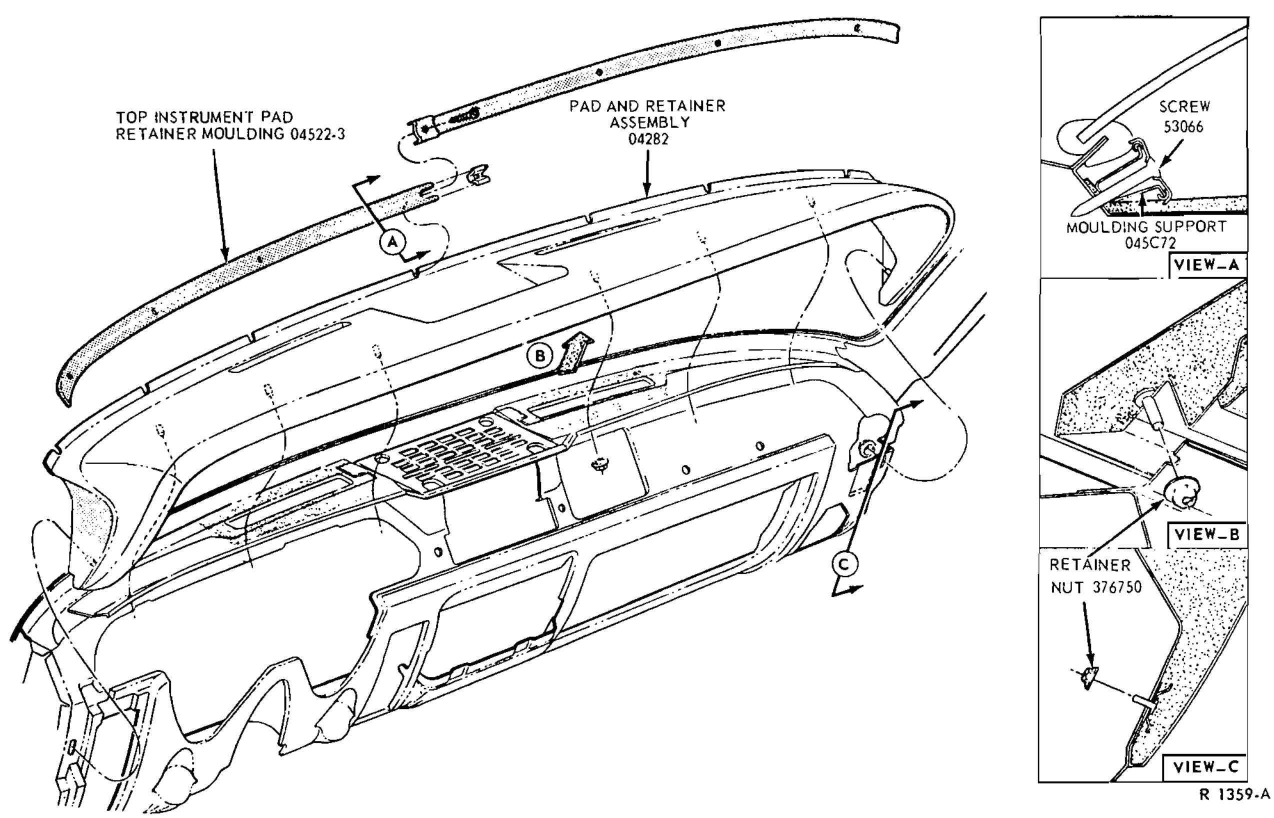


FIG. 18— Instrument Panel Pad Installation—Cougar

7. Remove the retaining screws from the glove box assembly and remove the assembly.

8. Working thru the glove box opening, remove the retaining nut from the lower right end of the instrument pad.

9. Remove the five screws and four nuts retaining the upper finish panel and remove the panel.

10. Remove the retaining screws from the top instrument pad retainer mouldings and remove the mouldings.

11. Working thru the heater control opening remove the retaining nut from the lower left end of the pad assembly.

12. Pry the A pillar pad assemblies loose and remove them.

13. Remove the six nuts retaining the pad assembly to the instrument panel and remove the pad assembly.

INSTALLATION

1. Position the pad assembly to the instrument panel and install the six retaining nuts.

2. Install the lower right and left nuts retaining the pad assembly to the instrument panel.

3. Position the center finish panel and install five retaining screws and four nuts.

4. Push the right and left A pillar pads into position to engage the retaining clips.

5. Position the top instrument pad retainer mouldings and install the retaining screws.

6. Insert the glove box in its opening and install the retaining screws.

7. Connect the windshield wiper switch plug, the constant voltage regulator connector and the multiple connector to the instrument cluster. Position the cluster to the instrument panel and install the seven retaining screws.

8. Thru the ash receptacle opening, install the inboard cluster retaining washer and nut.

9. Connect the cigar lighter connector. Position the ash receptacle in the instrument panel and install the three retaining screws.

10. Thru the heater control opening, connect the speedometer cable.

11. Position the heater control assembly to the instrument panel and install the retaining screws.

12. Install the thirteen (13) retaining screws in the front of the instrument pad assembly.

13. Connect the battery.

MUSTANG INSTRUMENT PANEL PAD

REMOVAL

1. Disconnect the battery ground cable. Remove the three retaining screws from the ash receptacle assembly, and disconnect the connector to the cigar lighter.

2. Remove the four screws retaining the heater control assembly to the instrument panel and position the assembly out of the panel.

3. Thru the heater control opening, remove the nut retaining the lower left end of the pad to the instrument panel (Fig. 19).

4. Remove the five retaining screws from the instrument cluster. Thru the ash receptacle opening, remove the nut and washer retaining the inboard end of the cluster to the instrument panel. Position the cluster out of the instrument panel.

5. Remove the three retaining screws from the glove box assembly.

6. Remove the retaining nut from the lower right end of the pad to the instrument panel.

7. Remove the retaining nuts from the lower, upper and center finish panels and remove the panels.

8. Remove the seven screws retaining the top instrument pad retainer mouldings and remove the mouldings.

9. Remove four pad retaining screws from the forward edge of the pad.

10. Pull the instrument panel pad from the instrument panel.

INSTALLATION

1. Position the pad to the instrument panel.

2. Install the four pad retaining screws at the forward edge of the pad.

3. Thru the heater control opening install the retaining nuts on the lower left of the instrument pad.

4. Install the retaining nut on the lower right of the instrument pad.

5. Position the center and upper finish panel and install the retaining screws.

6. Position the lower right finish panel to the instrument panel and install the retaining nut and screws.

7. Position the cluster to the instrument panel and install the five retaining screws, also install the inboard cluster retaining nut and washer.

8. Connect the cigar lighter connector. Insert the ash receptacle assembly in the instrument panel and install the three retaining screws.

9. Position the heater control assembly to the instrument panel and install the four retaining screws.

10. Insert the glove box assembly and install the three retaining screws.

11. Position the top instrument pad retainer mouldings and install the retainer screws.

12. Connect the battery.

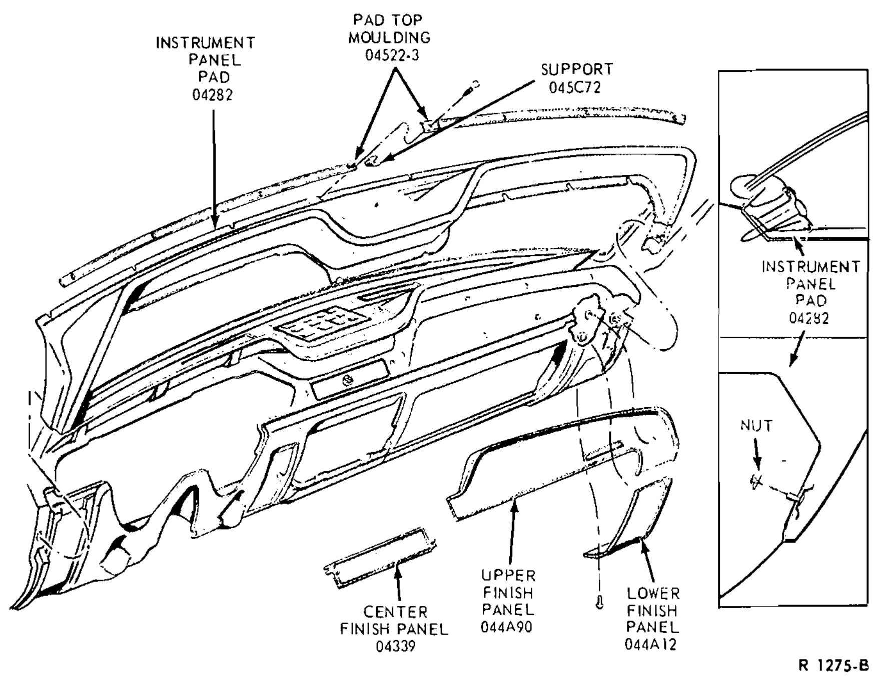


FIG. 19—Instrument Panel Pad Installation—Mustang

4 CONSOLE

CONSOLE—MUSTANG AND COUGAR

REMOVAL

1. Remove the set screw from the gear selector lever handle and remove the handle. Pry the top cover pad loose and remove the pad.
2. Raise the door on the glove box and remove the two retaining screws from the shift lever opening cover and remove the cover (Fig. 20).
3. Remove the three screws and retainers from the dial assembly to the console.
4. Remove the two screws retaining the radio to the rear support bracket.
5. Remove the six screws retaining the radio and console assembly and remove the assembly. Disconnect the antenna wire and feed wires to the radio and the connector to the console lamp wiring.

INSTALLATION

1. Connect the connector to the console lamp wiring and connect the radio wiring.
2. Position the radio and console assembly and install the six retaining screws.
3. Position the radio to its rear support bracket and install the retaining screws.
4. Install the dial assembly retainers and three retaining screws.
5. Position the shift lever opening cover on the console and install the two retaining screws.
6. Position the top cover pad and snap the pad into place.
7. Position the shift lever handle on the shift lever and install the retaining screws.

ROOF CONSOLE—COUGAR

1. Remove two console attaching screws and pull the console down to unclip the two retainers (Fig. 21).
2. Disconnect the wires from the console and remove the console from the vehicle.
3. Position the console in the vehicle and connect the wires.
4. Position the console to the roof and install the two retainers and attaching screws.

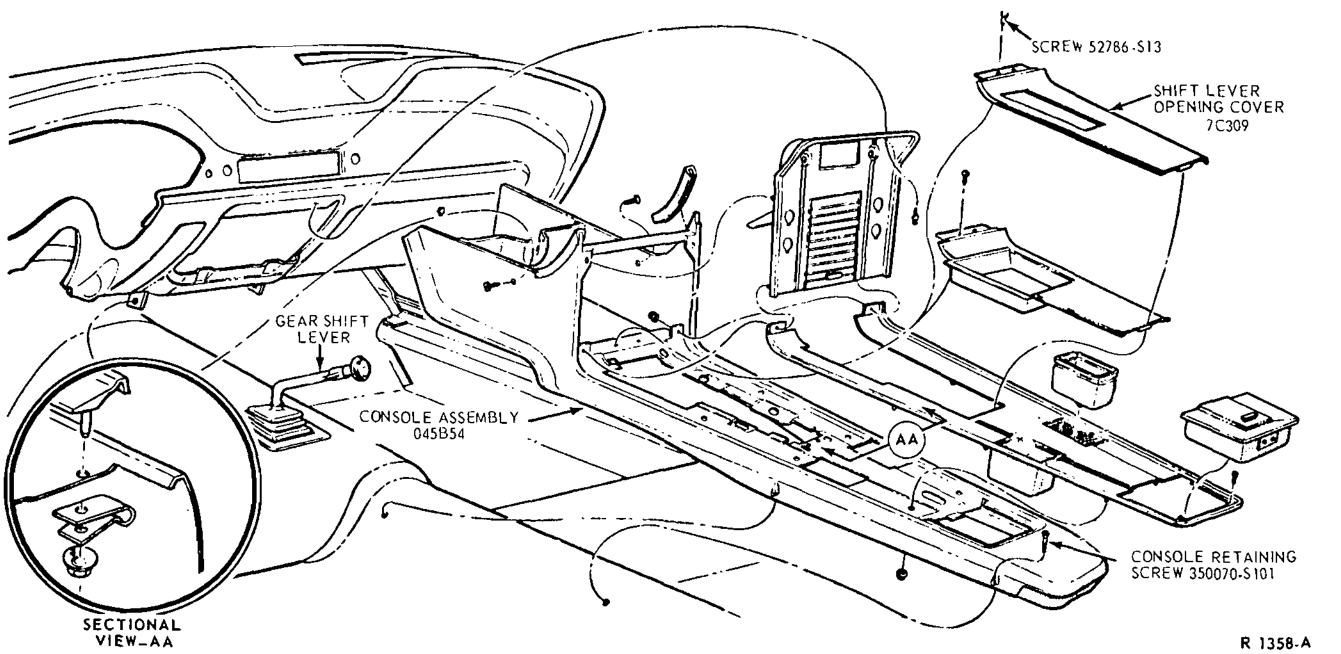


FIG. 20—Console Assembly—Mustang and Cougar

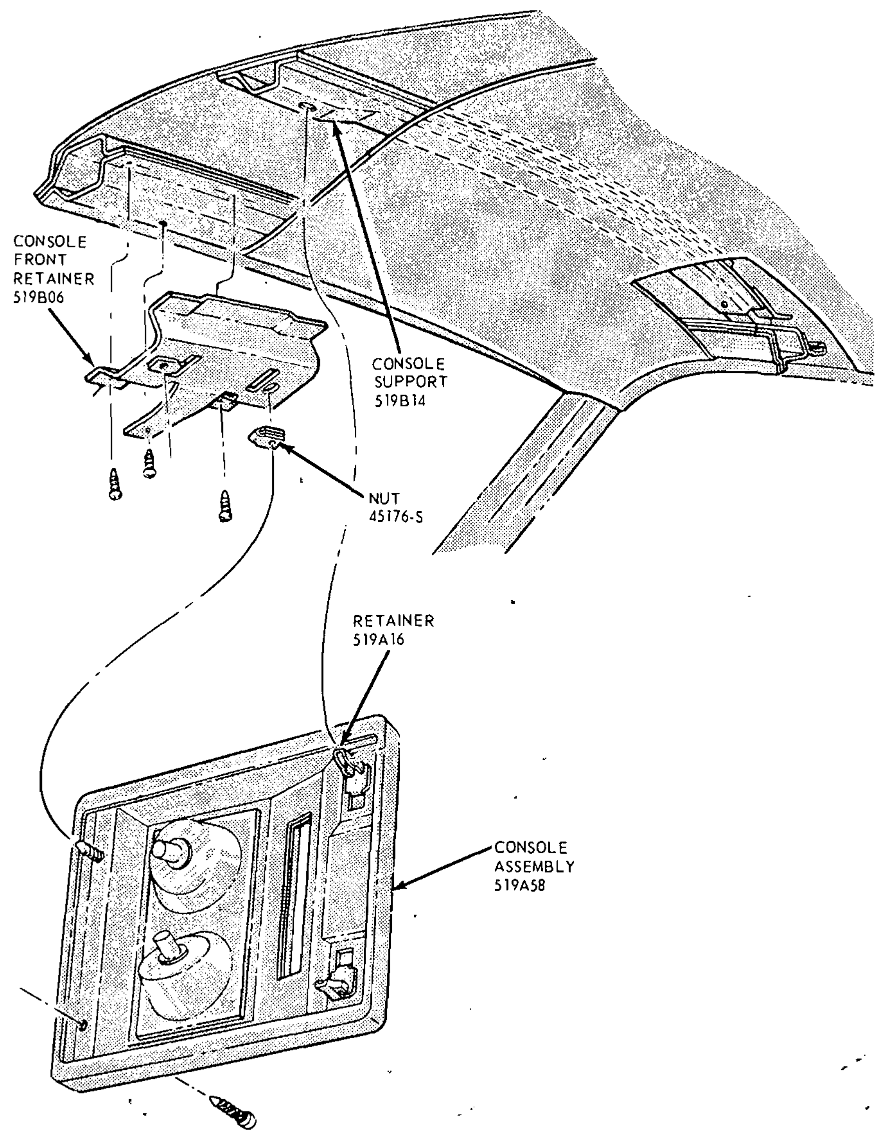


FIG. 21—Cougar Roof Console

5 ROOF OUTSIDE COVER

FALCON, FAIRLANE AND MERCURY INTERMEDIATE

REMOVAL

1. Remove the rear seat cushion back and quarter trim panels.
2. Remove the quarter trim panel retainer mouldings and quarter window garnish mouldings.
3. Remove the package tray panel and loosen the headlining in the quarter area sufficiently to permit access to the side belt moulding retainer nuts (Fig. 22).
4. Remove the side and rear belt mouldings.
5. Remove the back window outside mouldings. Remove the back window and weatherstrip.
6. Remove the windshield wiper arm assemblies and remove the top cowl panel.
7. Remove the side, top and bottom windshield outside mouldings.
8. From within the vehicle remove the rear view mirror assembly, the windshield pillar cap mouldings and the plastic windshield header moulding.
9. Cut the windshield sealer as described in Part 17-3 and remove the windshield.
10. Remove the sealer from the windshield pinch weld flange and remove the moulding retainer clips.
11. Remove the drip rail moulding and then using a 0.128 to 0.132 inch diameter drill, remove the rivets from the drip rail cover retainers and discard the retainers.
12. Remove the staples from the front and back window opening that are retaining the cover and remove the cover from the roof.

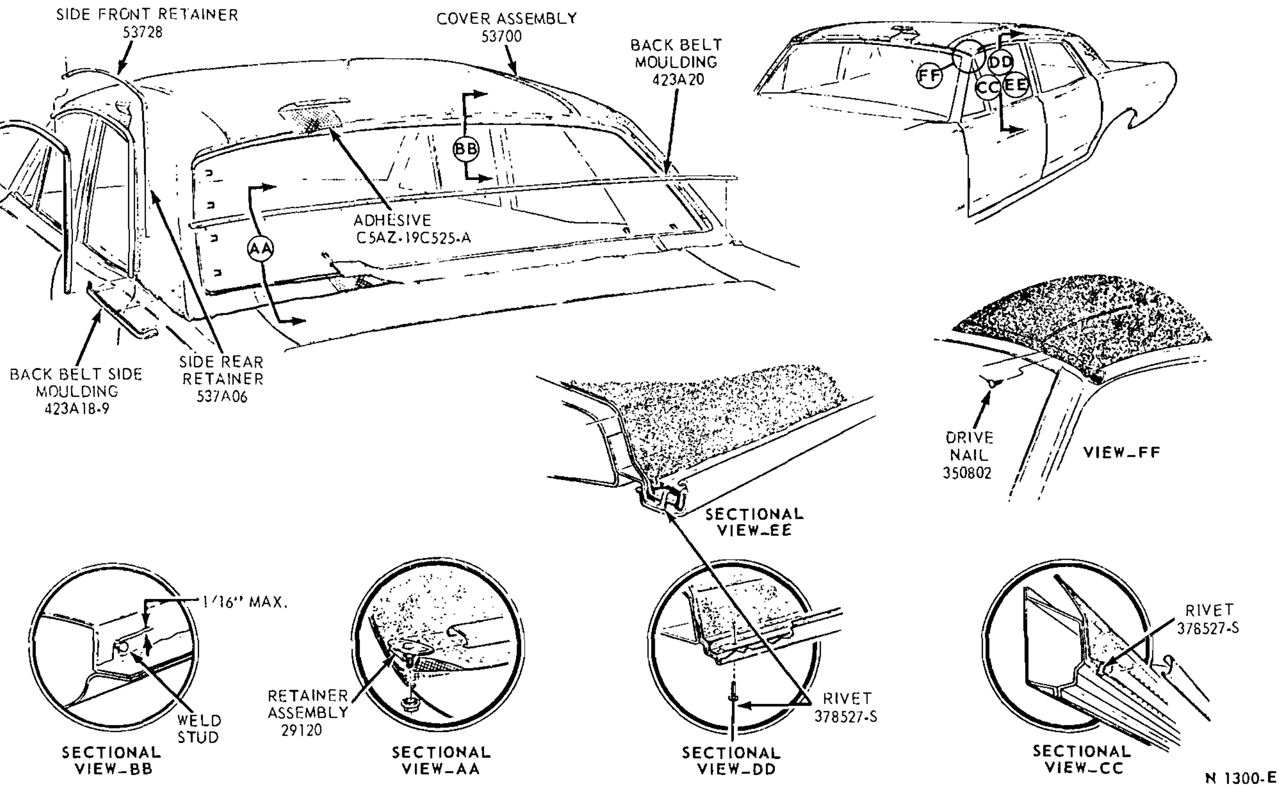


FIG. 22—Typical Roof Outside Cover Installation—Mercury Intermediate, Falcon, Fairlane

13. Remove the old adhesive from the roof area with a scraper or use an appropriate cleaning solvent. **It is extremely important that the entire roof and drip rails are thoroughly cleaned.**

INSTALLATION

It is recommended that drive nails be substituted for the staples shown in Fig. 22.

Wherever possible, use the existing drive nail or screw holes. Therefore, each location should be identified on the pinch weld flange with a wax crayon.

Seal all unused holes with either C1AZ-19627-A Pressure Sensitized Tape or AB-19560-A caulking cord.

1. Carefully position the outside cover on the roof panel. (Fore and Aft center punch marks have been provided in the cover for centering purposes.)

2. With the cover properly positioned and temporarily secured, apply an even coating of C2AZ-19C-525-A adhesive to the roof panel and a like amount to the corresponding area of the roof outside cover assembly. For best results, secure limited sections at a time. **Make certain that the adhesive is not lumpy as it will be objectionable from an appearance standpoint.**

3. Using a 0.128 to 0.132 inch diameter drill, pierce the vinyl material at the existing staple or screw hole locations. Install drive nails in each of the holes.

4. Position both drip rail retainers and, using the same drill referred to above, pierce the vinyl at each of the holes. Install the Pop rivets from the underside of the drip rail except at the extreme rear hole in which case the rivet should be inserted from the retainer side.

5. Trim the excess cover material from around the entire perimeter.

6. Apply sealer C3AZ-19562-A (for white tops) or sealer C3AZ-19562-B (for black tops) over the entire surface of the drip rail retainers. With the drip rail properly sealed, a minimum depth of 1/8 inch should be retained for adequate water drainage. **Place masking tape on the cover assembly for the entire length of the drip rail before applying sealer. After sealer has been applied, remove the tape.**

7. Install the drip rail mouldings.

8. Install the back belt center and side mouldings.

9. Reposition and secure the headlining.

10. Install the back window and outside window mouldings.

11. Install the quarter trim panel retainer mouldings and quarter window garnish mouldings.

12. Install the package tray panel, quarter panels, rear seat back and seat cushion.

13. Install the windshield.

14. Install the windshield interior garnish mouldings and sun visor assemblies.

15. Install the windshield exterior mouldings, retainers, and windshield wiper blade assemblies.

ROOF OUTSIDE COVER—MUSTANG AND COUGAR

REMOVAL

1. Disconnect the battery negative cable. At this time also unpack and spread out the roof cover.

2. Remove the windshield wiper arms. Also remove the windshield exterior mouldings using tool T64P-42006B or C (Refer to Part 17-3).

3. Remove the rear seat cushion and rear seat back.

4. Remove the five retaining screws from each of the quarter trim panels and remove the panels.

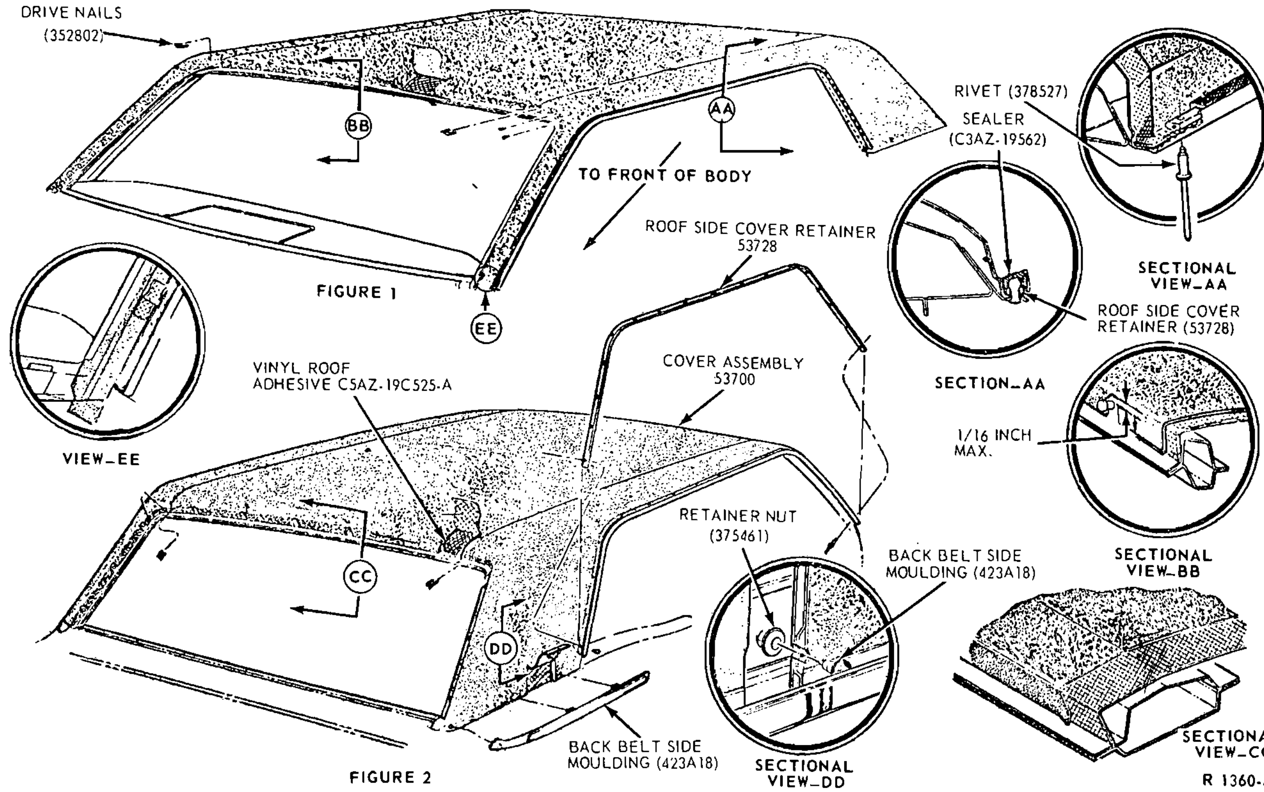


FIG. 23—Outside Roof Cover Installation—Mustang

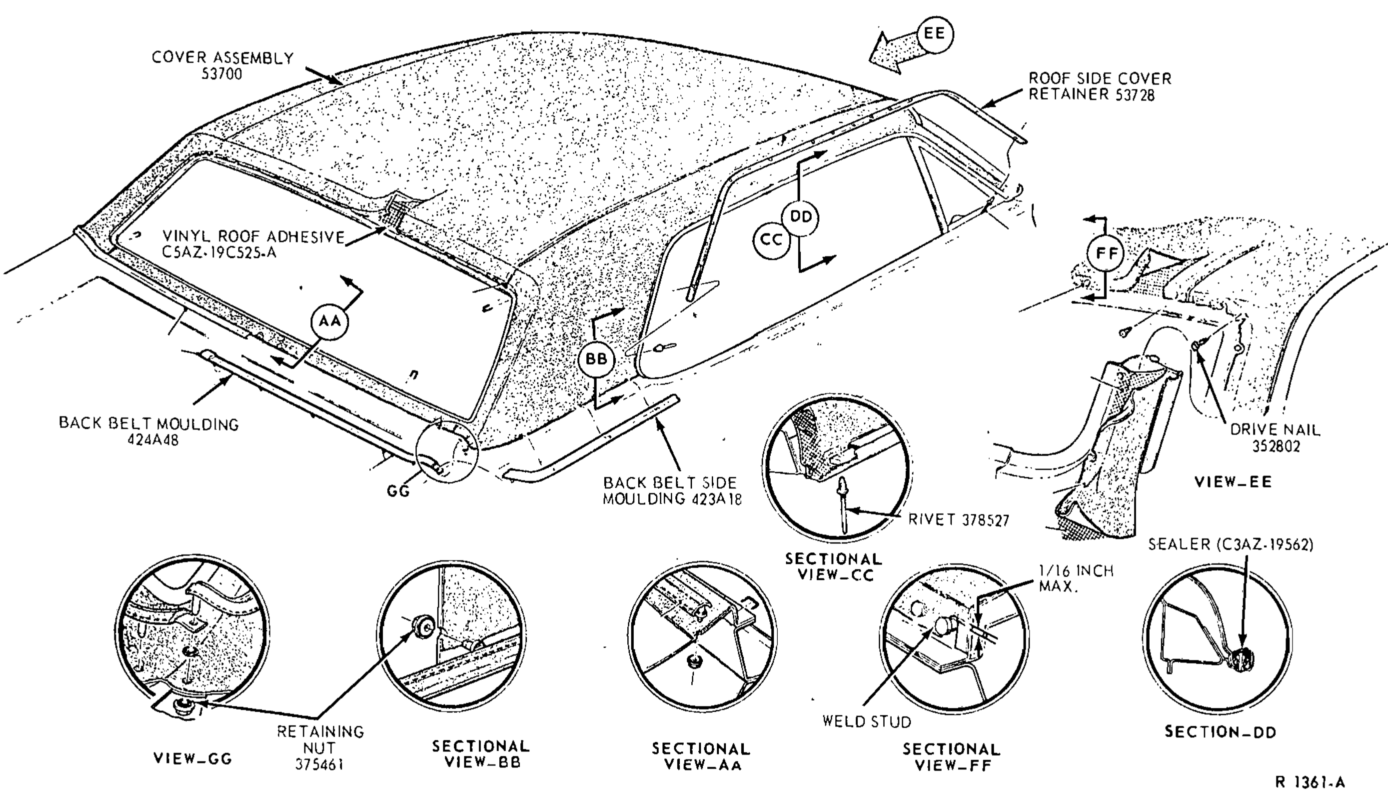


FIG. 24—Outside Roof Cover Installation—Cougar

5. On the Mustang only, loosen the headlining at the roof quarters.

6. Remove the retaining nuts from the right and left hand back side belt mouldings and remove the mouldings. Also the back belt moulding below the rear window on the Cougar (Figs. 23 and 24).

7. Remove the exterior moulding from around the rear window with tool T64P-42006-B or C.

8. Remove the moulding retainers from around the windshield and rear window.

9. Remove the left and right roof side drip rail mouldings.

10. On the Cougar only, remove the right and left weatherstrips and remove the ten retaining screws from each of the weatherstrip retainers and remove the retainers. Also remove the four rivets from each of the drip rail moulding extensions and remove the extensions (Fig. 25).

11. Remove the rivets retaining the right and left drip rail retainers and remove the retainers. The rivets may be drilled out with a 0.128 to 0.132 diameter drill.

12. Clean all mouldings and retainers and clean the excess sealer at the windshield and rear window.

13. Remove the outside roof cover, leaving the staples in place. Remove the old adhesive from the roof area with a scraper or appropriate cleaning solvent. **It is extremely important that the entire roof and drip rail are thoroughly cleaned.**

INSTALLATION

It is **necessary** that drive nails be substituted during installation for the staples.

Seal all unused holes and staples with sealer AB-19560A.

1. Locate the center line on the roof cover using the center punch marks that have been provided in the cover for this purpose. Also mark the center line of the roof to allow for proper alignment of the roof cover.

2. Apply Vinyl Roof Adhesive C5AZ-19C525-A to one half of the roof and the corresponding half of the roof cover, from the center line to the seam. **Make certain that the adhesive is not lumpy as it will be objectionable from an appearance standpoint.**

3. Carefully align the center lines of the roof cover and roof. Then stretch and smooth the roof cover into position.

4. Apply adhesive to the remaining part of the roof and the corresponding roof cover and install the cover as outlined in the preceeding step.

5. Apply adhesive to the remaining parts of the roof and roof cover, except the window opening.

6. Position the remaining parts of the roof cover to the roof sides and roof quarters, stretch and smooth as necessary. Trim or make any angular cuts in the roof cover around the window openings. On the Cougar only; start below the rear window.

7. Trim all selvage from the cover, leaving about 1/2 inch around the window openings.

8. Apply adhesive to the front pillars and position the cover.

9. Apply adhesive to the window opening areas and stretch the cover into position. Cut the cover from around the moulding retainer studs.

10. Using an awl, pierce the roof cover at intervals of 1 1/2 inches around the window openings. Install the drive nails in each of the holes in the roof cover. Be sure to apply sealer to each of the nails before they are installed. Also take precautions to protect the window glass during this operation.

11. Position both drip rail retainers and, with the awl pierce the roof cover at each of the holes. Install the seventeen (17) retaining rivets in the retainers. On the Cougar it is also necessary to install four rivets in the drip moulding extensions.

12. Install the right and left hand drip rail mouldings.

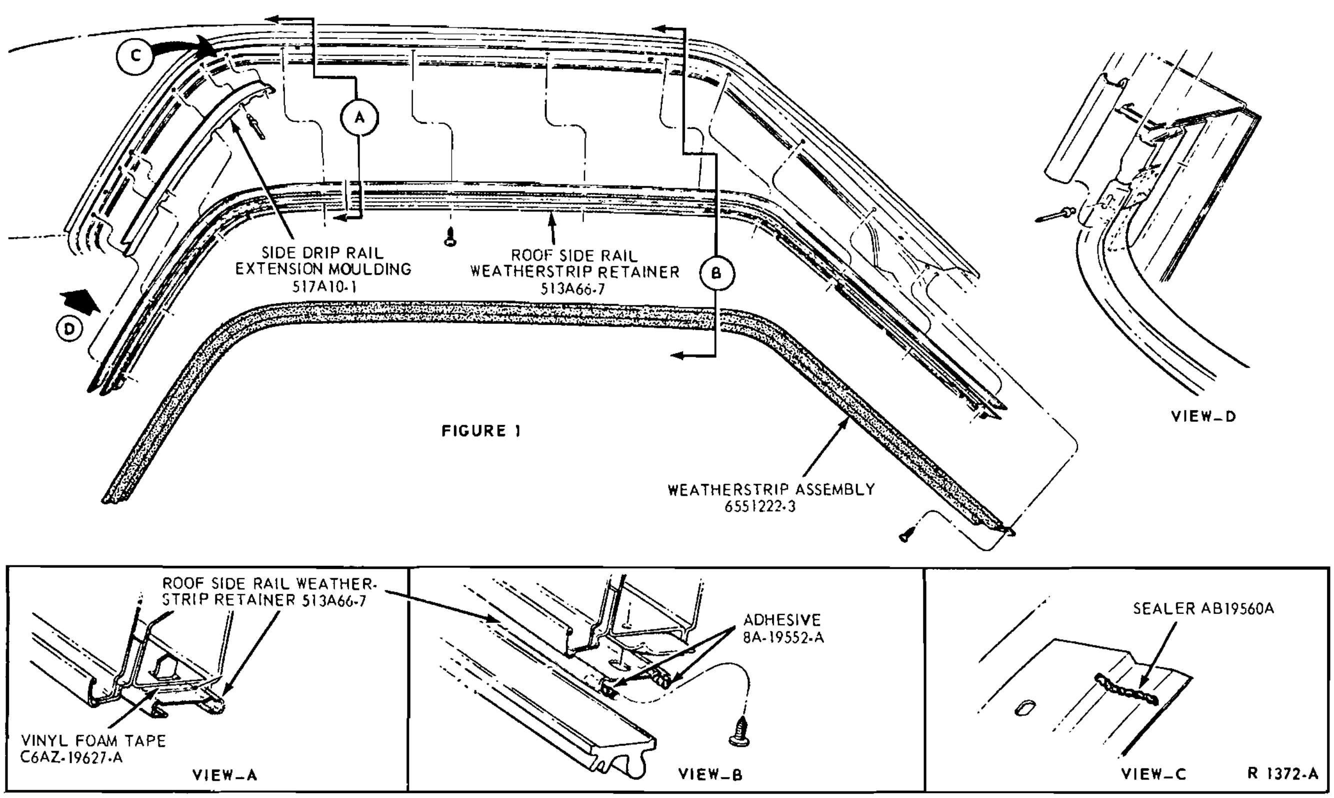


FIG. 25—Roof Side Rail Weatherstrip Installation—Cougar

13. On the Cougar only; install the weatherstrips and the weatherstrip retainers shown in Fig. 25.

14. Install the exterior window moulding retainers around the windshield and rear window. Also apply sealer AB-19560A around the windshield and rear window.

15. Position and install the windshield and rear window exterior mouldings.

16. On the Cougar only; install the back belt mouldings and nine retaining nuts below the rear window.

17. Install the back side belt mouldings and the retaining nuts.

18. On the Mustang only; install the headlining at the roof quarters.

19. Position and install the quarter trim panels and install the rear seat back and seat cushion.

20. Install the windshield wipers and thoroughly clean the cover and moulding areas.

21. Connect the battery negative cable.

PART 18-2 — *Seats*

1 STANDARD SEATS

REMOVAL AND INSTALLATION

SEAT AND SEAT TRACK

Work, other than that of minor nature, is more easily performed when the front seat assembly is removed from the car.

1. Remove the nuts retaining the seat tracks to the floor pan. If equipped with power seats, disconnect the seat wiring loom connector. Lift the seat assembly from the car (Figs. 1 and 2).

2. Disconnect and remove the release cable from the seat frame. Remove the seat tracks from the seat frame.

3. Transfer the seat adjusting lever knob and the retracting springs, if necessary, to the new track assembly.

4. Position the seat tracks on the seat frame and install the retaining bolts and release cable.

5. Position the seat assembly in the car and install the retaining bolts and nuts.

Release Cable Adjustment. Release cable maladjustment will affect only the right side of the seat. In case the latch retaining the track fails to release, turn the release cable

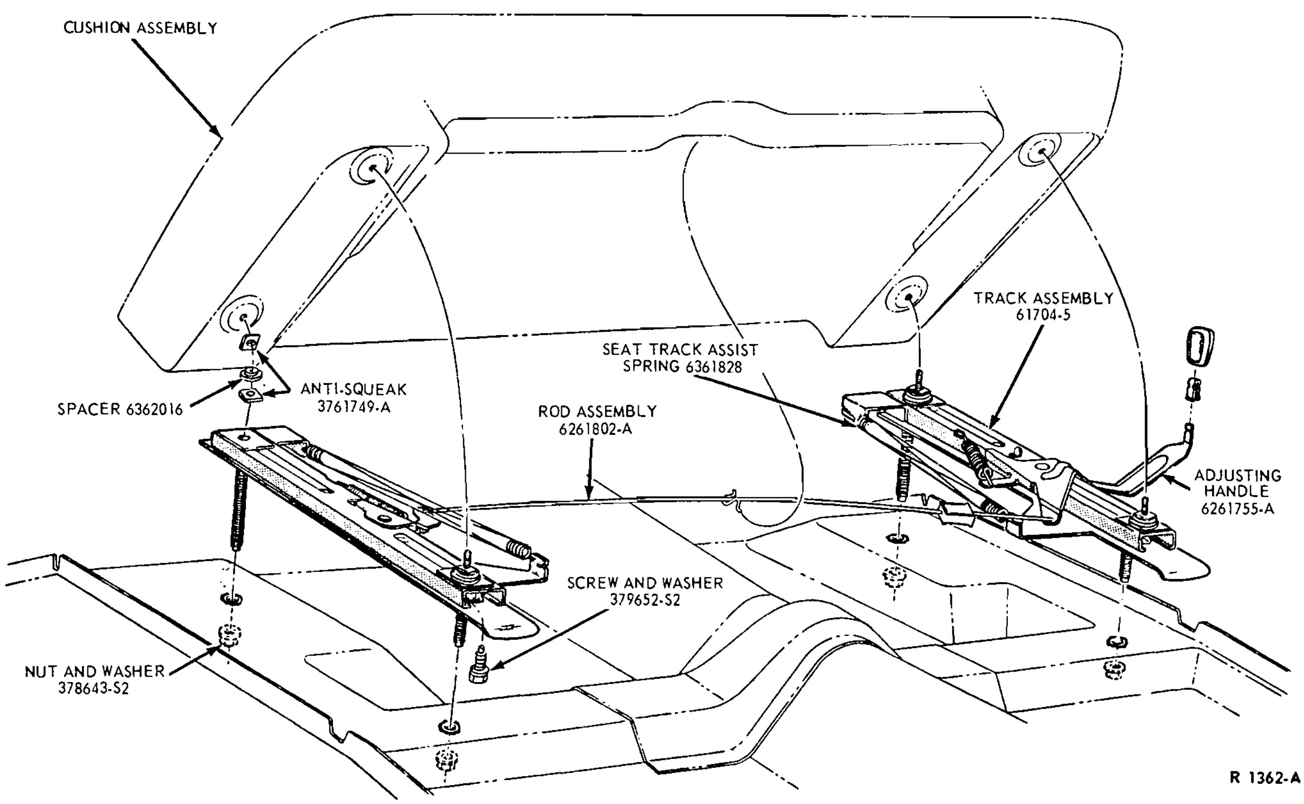


FIG. 1—Typical Front Seat Track Installation—Falcon, Fairlane, Mercury Intermediate

turnbuckle or eye bolt enough turns to shorten the release cable travel sufficiently to release the track latch. If the latch fails to secure the seat travel, turn the release cable turnbuckle or eye bolt to lengthen the release cable enough to allow the latch to snap in the locking position.

FRONT SEAT CUSHION AND/OR BACK

1. Remove the front seat and seat track from the car if the cushion is to be replaced.
2. To replace the seat cushion, remove the seat assembly from the seat track.
3. On cars with a solid seat back, remove the bolts and washers attaching the seat back to the seat cushion frame. Before being able to remove the attaching bolts it is necessary to remove the seat back and seat cushion trim from the bolts.
4. On cars with a split front seat back, remove the hairpin clip from the center seat back stud and the seat cushion stud. Before being able to remove the hair pin clips it is necessary to remove the pivot covers.
5. Position the seat back assembly on the seat. On cars with the split seat back, install the hairpin clip at the seat center bracket and the seat cushion stud and install the pivot covers.
6. On a car with a solid seat back, install the bolts and washers attaching the seat back to the seat and fasten the seat back and seat cushion cover trim with hog rings.
7. Position the seat cushion on the seat track and install the retaining bolts if removed.
8. Install the front seat and seat track in the car.

REAR SEAT CUSHION AND/OR BACK

1. Lift the rear seat cushion and pull it forward to remove it from the car.
2. Remove one rear seat arm rest (two-door sedans).
3. Remove 2 rear seat back attaching screws located at the bottom of the seat back. On the Mustang Model 63 there are four screws retaining the seat along the bottom.
4. Lift up on the seat back to disengage the seat from the upper hooks and remove the seat back from the car.
5. Position the seat back in the car and engage the seat with the upper hooks.
6. Install the seat back lower retaining screws and the removed arm rest. Then install the rear seat cushion.

FRONT SEAT CUSHION COVER

Figs. 3 and 4 show a front seat cushion buildup. Seat cushions for all models are built up in basically the same manner. Therefore, when installing new seat cushion covers or pads, refer to Figs. 3 and 4 for the location of listing wires, hog rings, anti-squeak pads, and seat pad stack-up.

1. Remove the seat and seat track assembly.
2. On models with a solid seat back, remove the bolts and washers attaching the seat back to the seat cushion frame.
3. On models with a split seat back, remove the seat back outer support arm covers and remove the hairpin clips from the pivot pins.
4. On models with a split seat back, remove the retaining screw from the seat back center support trim cover and remove the seat back center pivot hair pin clips.
5. Remove the seat back assembly.
6. Remove the seat back stop plates from the seat cushion.
7. Remove the hog rings retaining

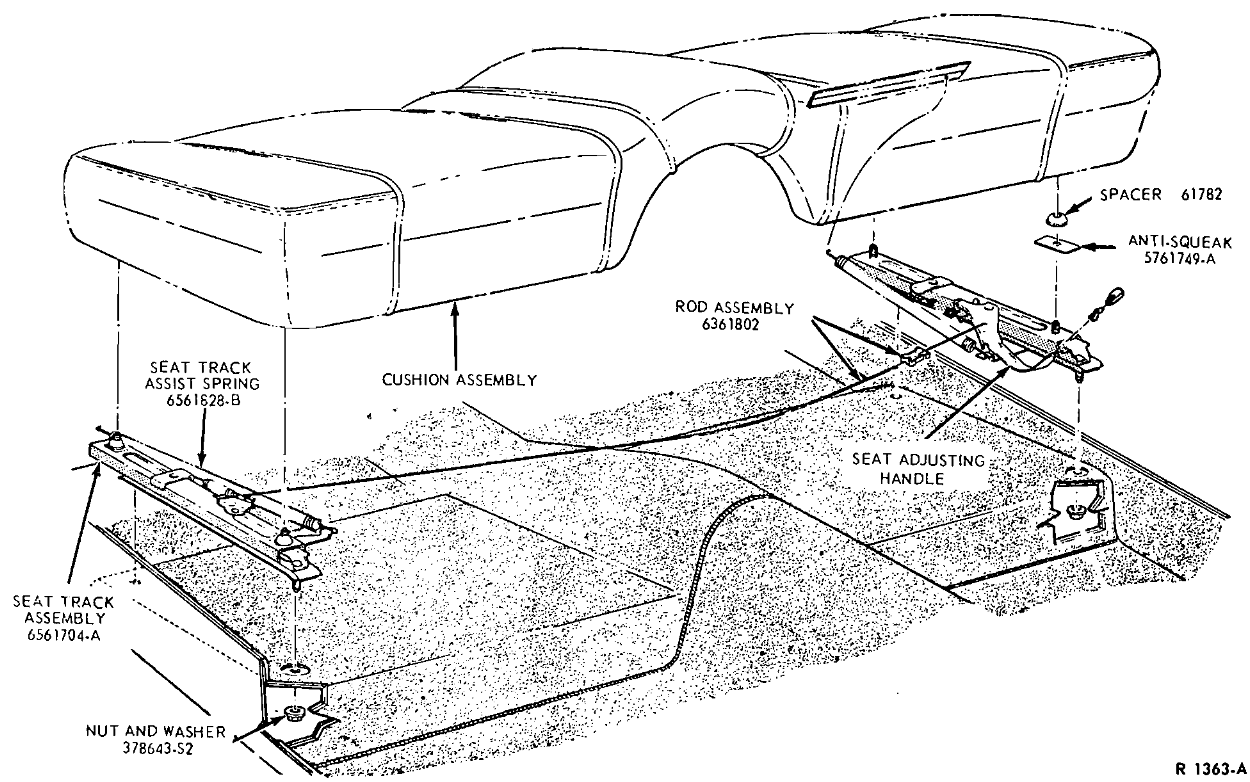


FIG. 2—Typical Front Seat Track Installation—Mustang, Cougar

the seat cushion cover and remove the cover (Figs. 2 and 3). Inspect the pad and replace it if necessary.

8. Transfer the listing wires to the new cover.

9. With the seat cushion assembly right side up, make sure that the pads are stacked properly and centered; then place the cover over the pads to hold them in position.

10. Carefully turn the seat assembly over so that the pads do not shift out of position.

11. After centering the cover and straightening the seams along the front edge of the cushion, fasten the cover to the front of the seat frame with hog rings. Make sure that the hog rings encircle the listing wire. Install 1 hog ring in each hole provided in the seat cushion frame.

12. At the rear of the seat assembly, pull the cover taut over the pads, and install hog rings at the seat frame.

13. Fasten the side of the cover to the seat frame side with hog rings through the holes provided (Figs. 2 and 3).

14. Install the seat back stop plates and the seat back.

15. Install the seat tracks to the cushion and the seat assembly in the car.

REAR SEAT CUSHION COVER

1. Remove the rear seat cushion from the car by lifting on the front of the seat and pulling it forward.

2. Remove the cushion cover hog rings and remove the cushion cover from the seat frame.

3. Inspect the pad and replace it if necessary.

4. Transfer the listing wire, if equipped, to the new cushion cover.

5. Position the new cushion cover on the seat frame and springs and attach it in place with hog rings (Fig. 5).

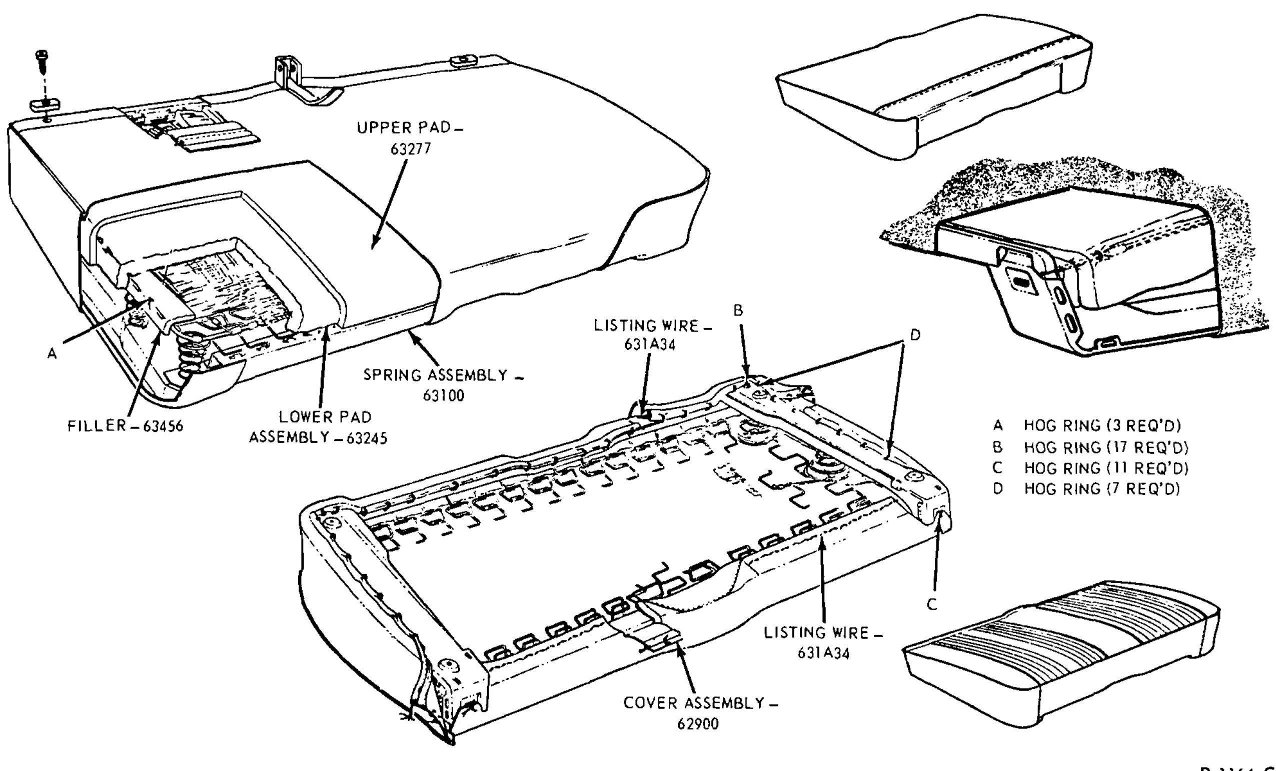


FIG. 3—Typical Front Seat Cushion Cover Installation—Falcon, Fairlane, Mercury Intermediate

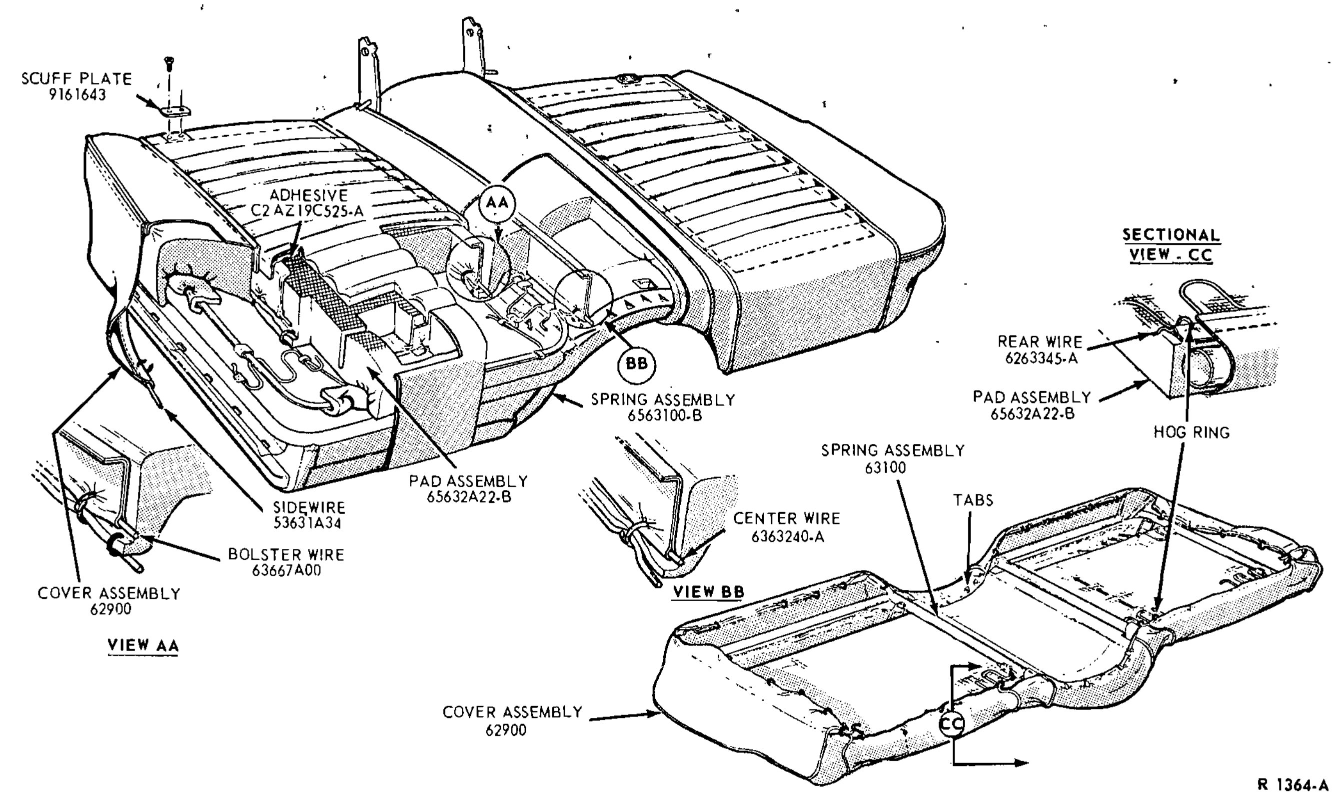


FIG. 4—Front Seat Cover Installation—Mustang, Cougar

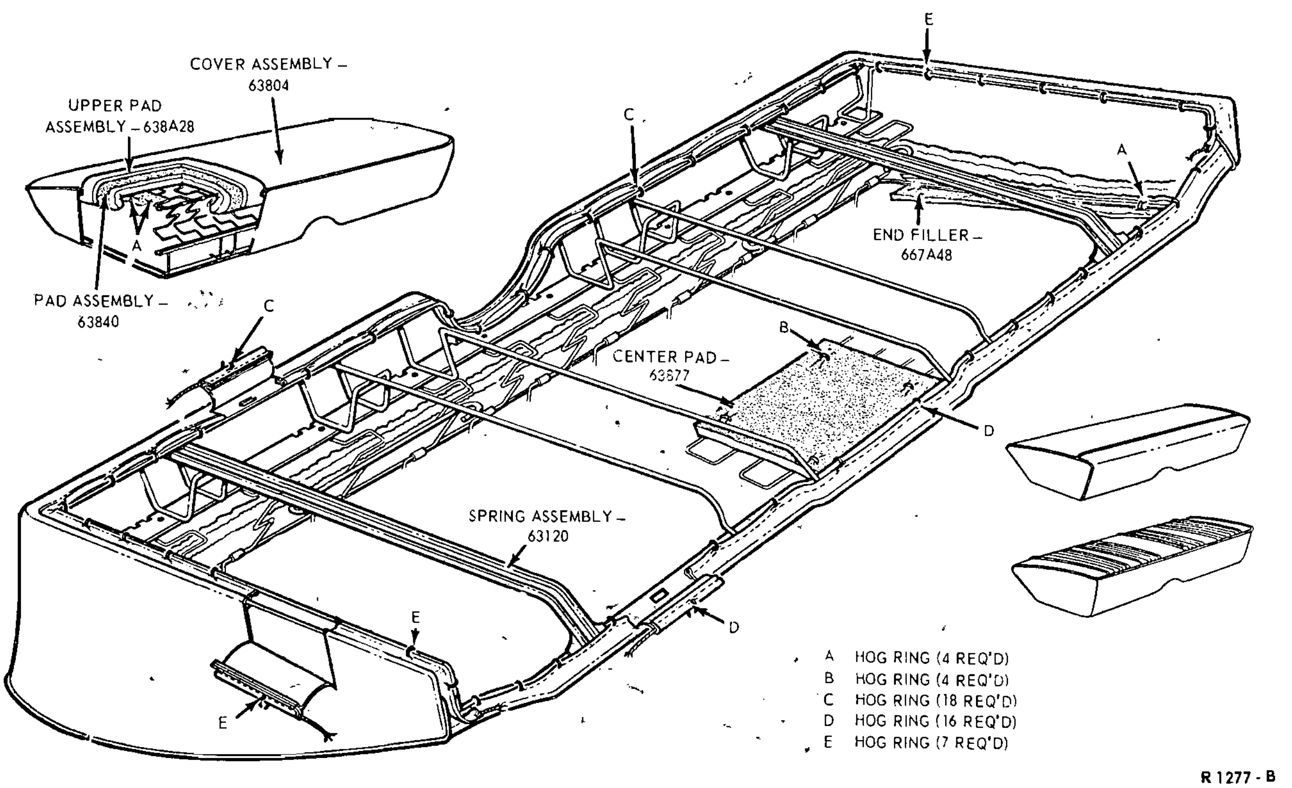


FIG. 5—Typical Rear Seat Cushion Cover Installation

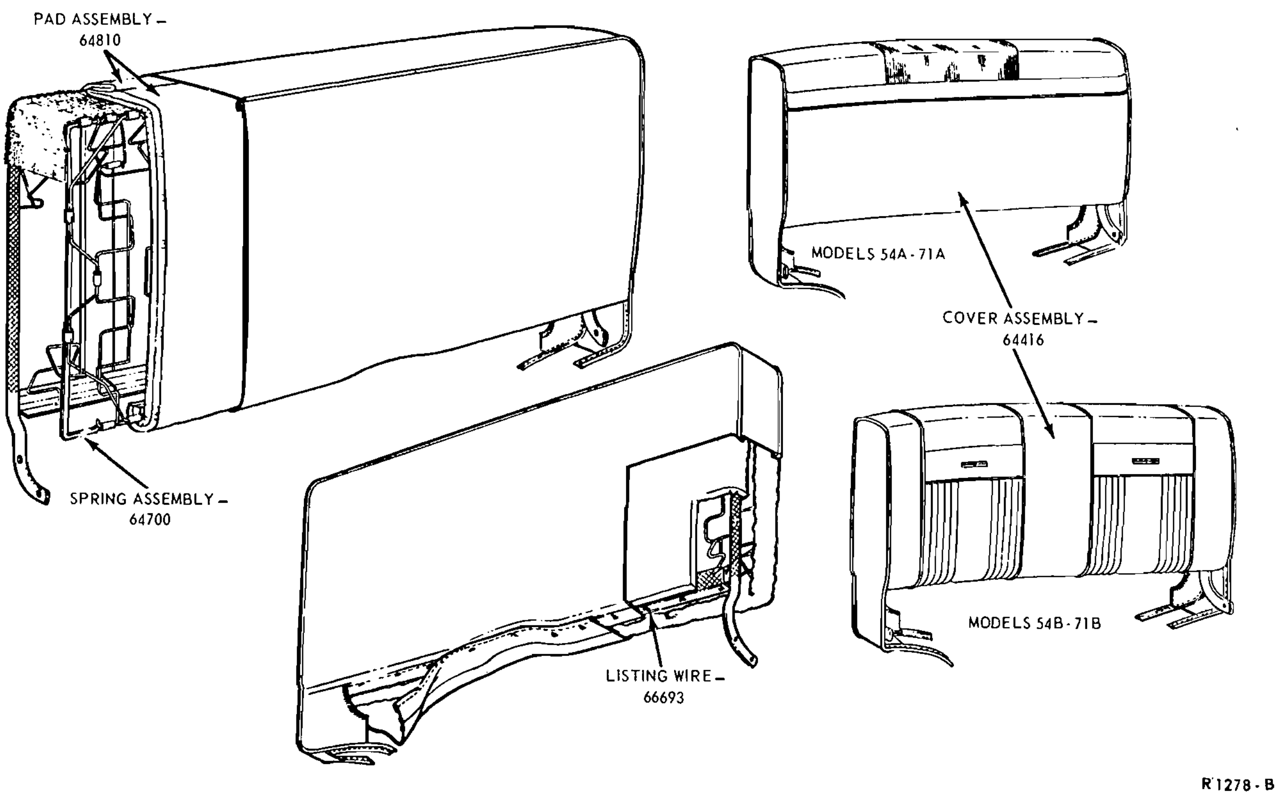


FIG. 6—Typical Front Seat Back Cover Installation—4-Door

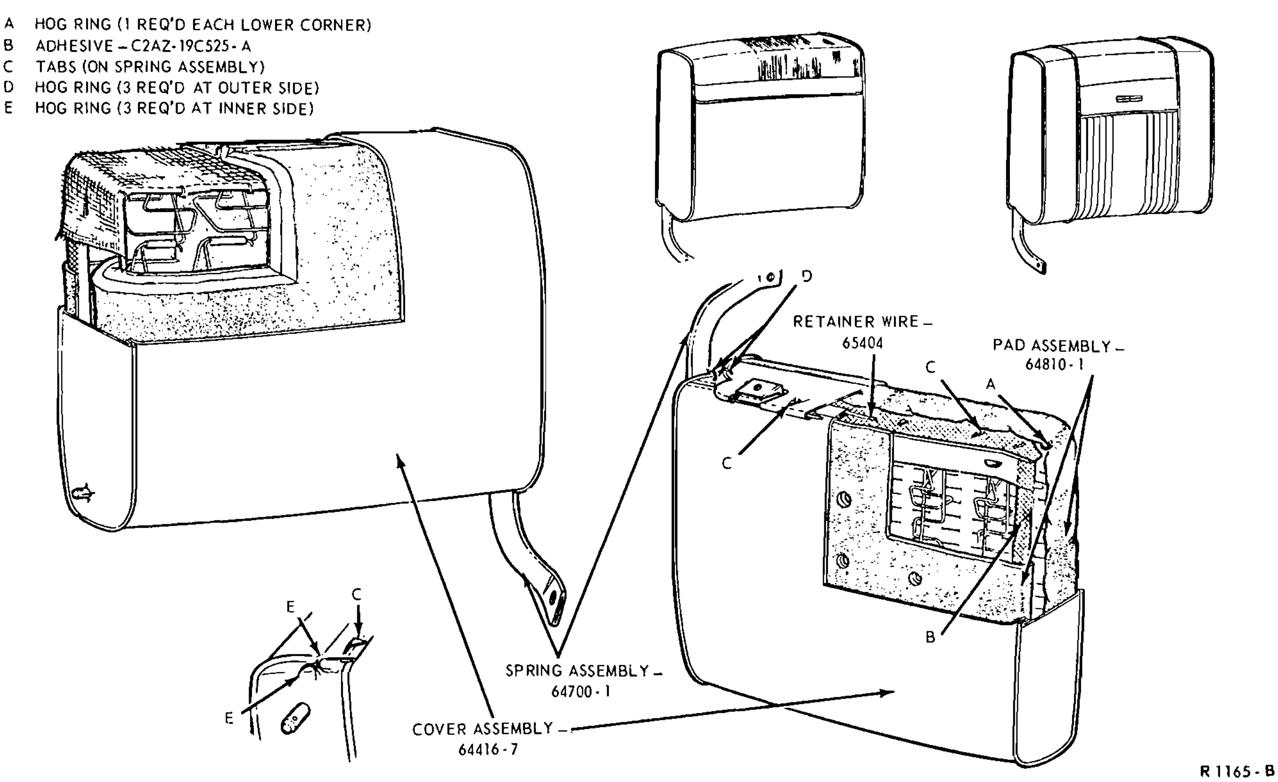


FIG. 7—Typical Front Seat Back Cover Installation—2-Door

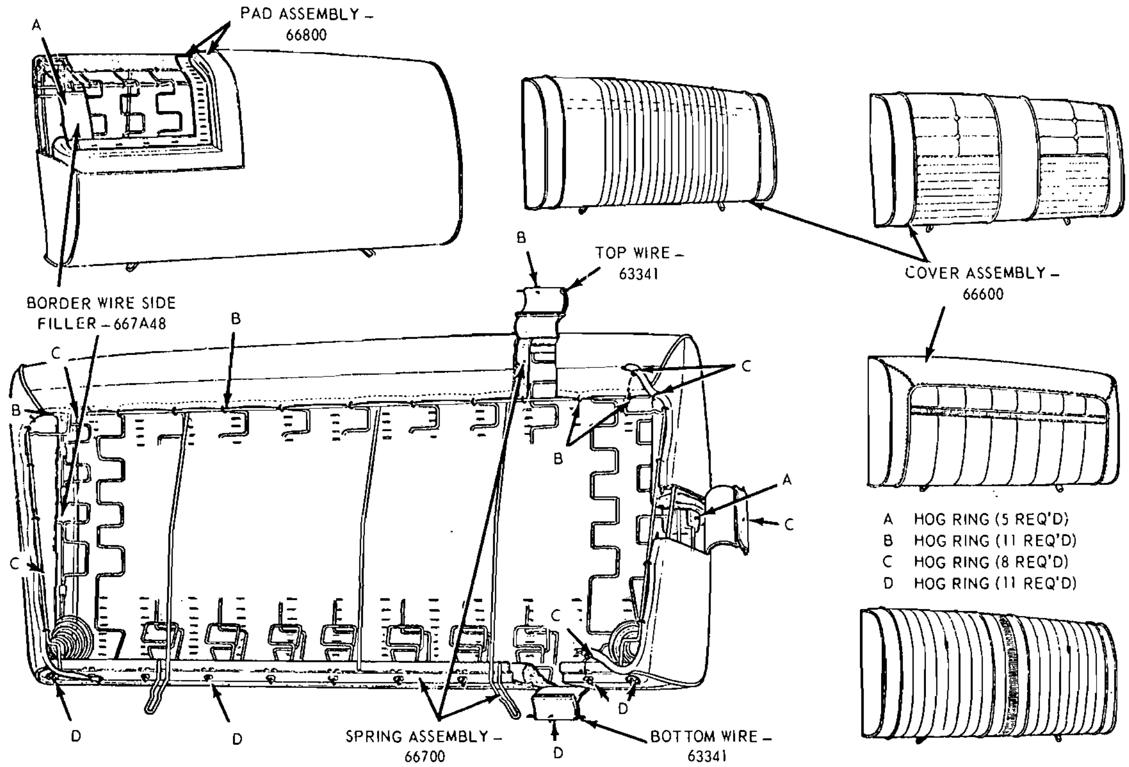


FIG. 8—Typical Rear Seat Back Cover Installation

2 BUCKET SEATS—MANUAL

The seat is mounted in the conventional manner on two seat tracks. The seat release is located at the lower front center of the seat, and is operated by pulling the lever side ways to release the seat tracks.

REMOVAL AND INSTALLATION

SEAT AND SEAT TRACK

The seat track assembly is easily replaced if the seat assembly is removed from the car.

1. Remove 4 floor pan plug buttons to gain access to the seat track retaining nuts (Mustang and Cougar only).
2. From under the car, remove the seat track retaining stud nuts and washers. Remove the seat assembly from the car and place it on a clean work area.
3. Remove the screws which retain the seat track assembly to the seat cushion and remove the seat track assembly (Figs. 9 and 10).
4. Disconnect the seat track brace and latch release rod from the track being replaced, and connect these parts to the new seat track.
5. Loosely install the track-to-floor retaining studs in the seat track.
6. Place the seat track assembly on the seat cushion, and install the retaining screws.
7. Place the seat assembly in the car and install the washers and nuts on the retaining studs.
8. Install the floor pan plug buttons (Mustang and Cougar only).

FRONT SEAT CUSHION COVER

Repairs to seat cushions or seat backs are performed out of the car and are usually limited to replacement of torn or burned seat covers. In a few instances, the pads may be damaged and require replacement.

When installing a new seat cover or pad, refer to Figs. 11 and 12 for the location of listing wires, hog rings, anti-squeak pads, and seat pad stack-up.

Mercury Intermediate, Falcon (Model 76 Only)

1. Remove the seat and seat track assembly from the car and place it on a clean work area.
2. Remove the seat cushion from the seat track. From each side of the seat, remove the seat back retainer, and remove the seat back.
3. Remove the seat back scuff plates and remove the hog rings retaining the seat cushion cover to the spring assembly. Separate the bottom cover from the seat cushion pad and remove the cushion cover.
4. Inspect the pad and spring assemblies, and repair or replace as necessary.
5. Transfer the listing wires to the new cover.
6. Place the new cover assembly over the pad and seat spring assembly and secure it to the front bolster wire with hog rings. Apply trim cement (C2AZ-19C525-A) to the bottom of the cushion cover and position the cover correctly to the seat cushion pad.
7. Secure each side bolster wire to the seat spring assembly with hog rings.
8. The front and side edges of the cover assembly can now be secured to the bottom of the spring assembly with hog rings as shown in Fig. 11.

9. Secure the rear edge of the cover assembly to the bottom of the spring assembly with hog rings.
10. Install the two scuff plates on the cushion.
11. Install the seat back side shield and seat tracks. Install the seat assembly.

Mustang and Cougar

1. Remove the front seat and track from the car and remove the seat tracks from the seat.
2. Remove the front seat back shield and the seat back pivot side cover.
3. Remove the seat back pivot pin and remove the seat back from the seat cushion.
4. Remove the seat cushion scuff plate.
5. Remove the seat cushion cover and pad.
6. Position the seat cushion pad on the frame and install the hog rings (Fig. 12).
7. Position the cushion cover on the pad. Cement with trim cement (C2AZ-19C525-A) and retain with hog rings (Fig. 12).
8. Install the seat cushion scuff plate.
9. Position the seat back on the pivot and install the pivot pin.
10. Install the front seat back shield and the seat back pivot side cover.
11. Install the seat on the seat tracks and install the seat and seat track in the car.

FRONT SEAT BACK COVER

1. Remove the seat and seat tracks from the car, if required, for accessibility to the seat side shield retaining screws.
2. Remove the right and left seat back side shields and remove the seat back retaining bolts or retainer pins and remove the seat back from the cushion.
3. Unsnap and remove the seat back rear cover (Figs. 11 and 12).
4. Remove the seat back upper moulding retaining screws and remove the mouldings.
5. Remove the seat back stop adjusting bolts and remove the hog rings retaining the cover to the frame.
6. Bend up the side retaining tabs (Fig. 11) and lift the cover off the tabs.
7. Remove any additional hog rings retaining the cover to the seat frame.
8. Position the trim cover off the side padding to gain access to the

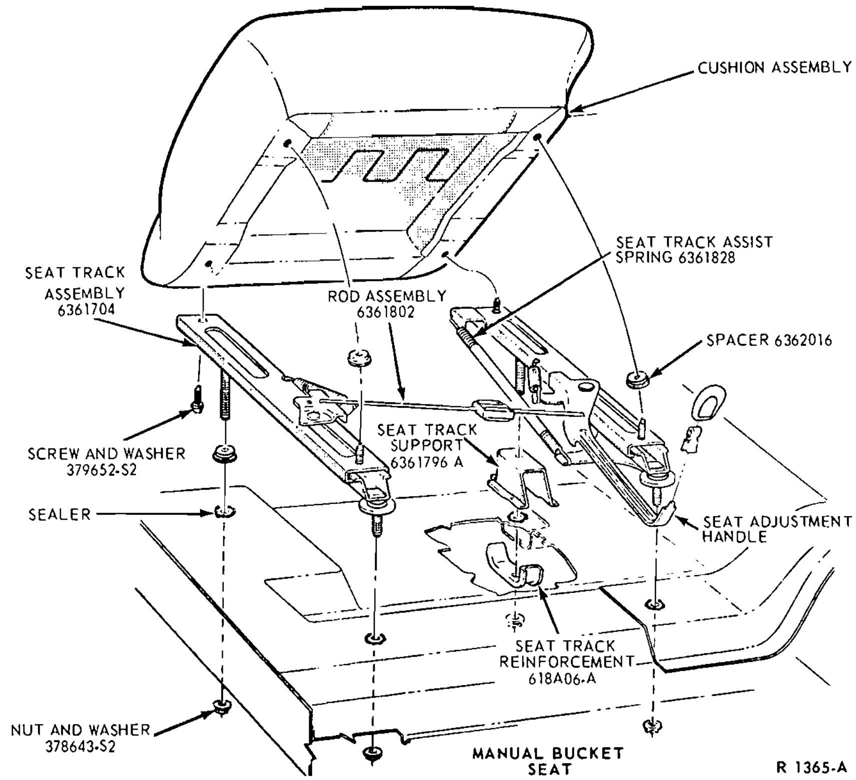


FIG. 9—Bucket Seat Installation—Falcon, Fairlane, Mercury Intermediate

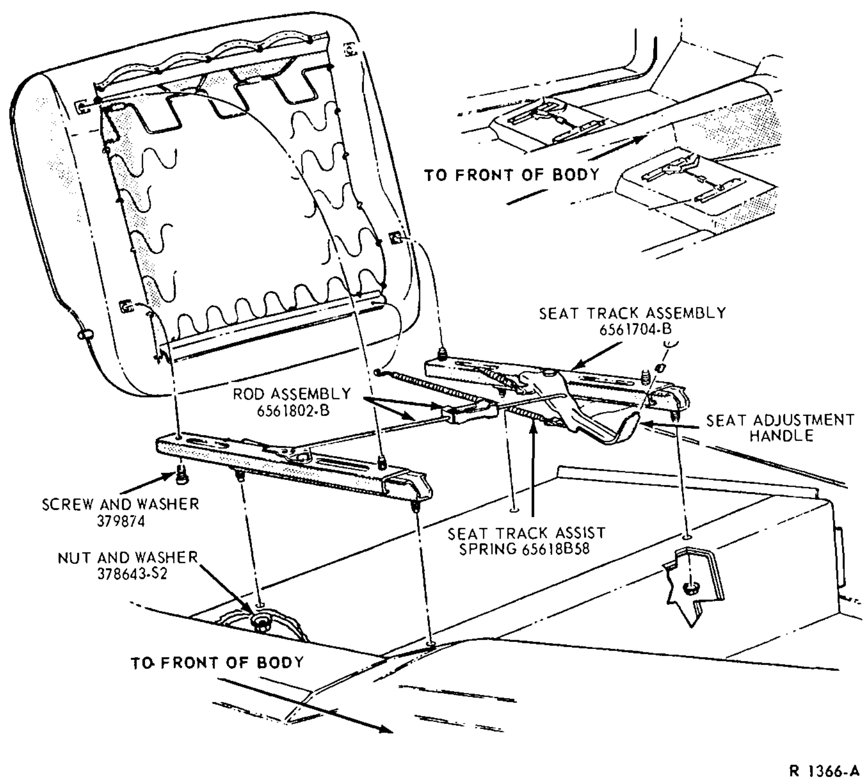


FIG. 10— Bucket Seat Installation—Mustang, Cougar

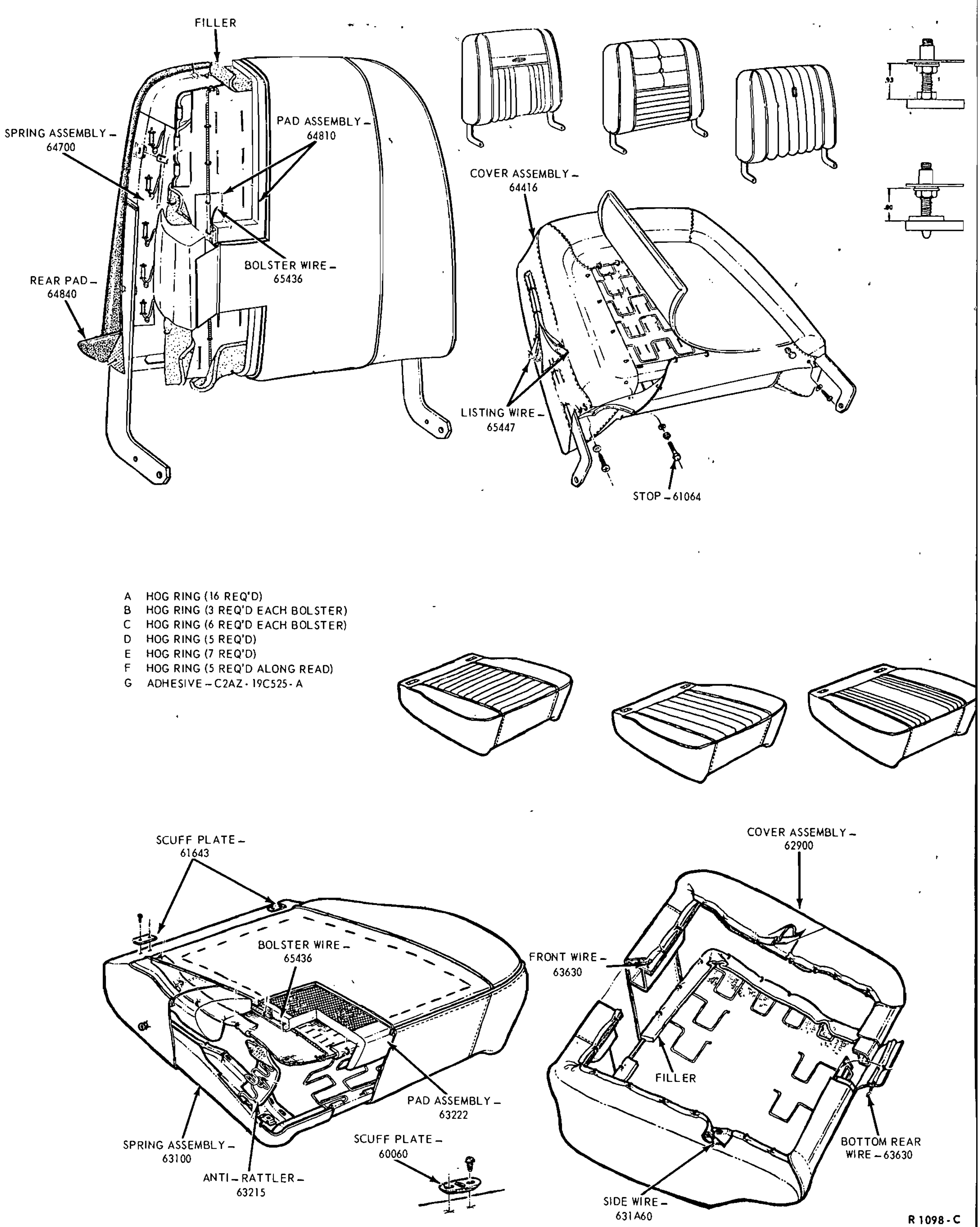


FIG. 11—Typical Bucket Seat Back and Cushion Cover Installation—Mercury Intermediate, Falcon, Fairlane

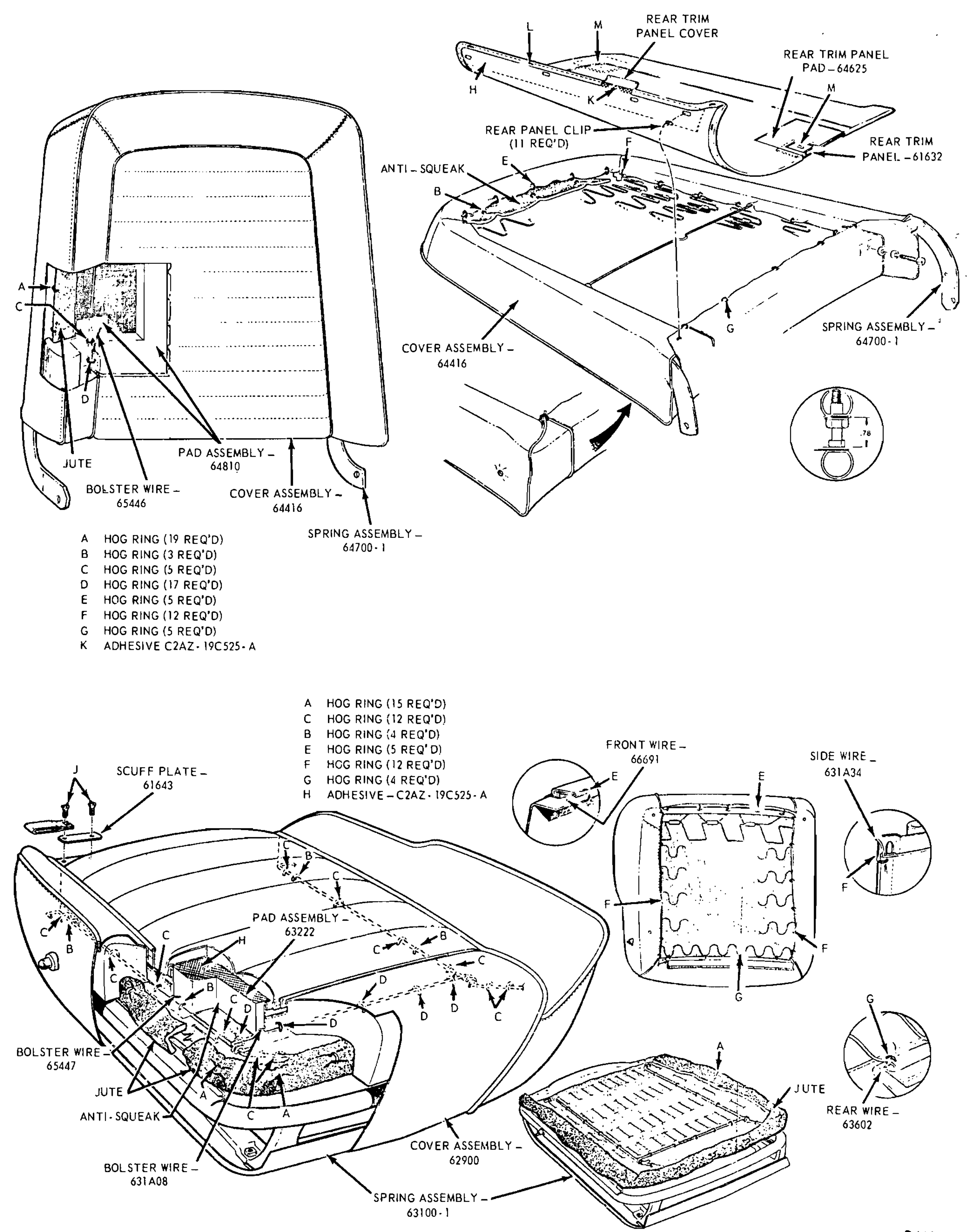


FIG. 12—Typical Bucket Seat Back and Cushion Cover Installation—Mustang and Cougar

hog rings in the center of the seat back and remove the hog rings.

9. Position the new cover over the front center of the seat back and attach it with hog rings. Position the cover around the sides and top of the sponge padding, pulling the material tight. Then, turn the seat back face down.

10. Pull the trim cover tight and install hog rings at the top. Pull the cover tight and install hog rings at the bottom.

11. Pull the trim cover tight at the sides and position it over the side retaining tabs (Fig. 11). Bend the tabs down.

12. Position the rear cover on the seat back and snap it into place. Install the seat back stop adjusting bolts and nuts.

13. Install the seat back upper moulding.

14. Install the seat back on the cushion and install the seat back pivot covers.

15. Install the seat and seat track in the car.

3 POWER SEATS

REMOVAL AND INSTALLATION

BENCH SEAT TRACK—POWER —MERCURY INTERMEDIATE

Removal

1. Remove the retaining bolts from the two inboard seat belts at the tunnel.

2. Remove the four seat track retaining nuts. Disconnect the seat wiring loom at the quick disconnect and remove the seat assembly from the vehicle. (Fig. 13).

3. Remove the four retaining screws from the cushion assembly to the seat track.

4. Disconnect the wires leading from the seat control switch assembly at the quick disconnect and separate the cushion assembly from the seat track.

5. Release the tension on the assist springs on the seat track assembly.

6. Remove the six screws retaining the three drive units to the track assembly and separate the units from the track.

7. Remove the relays from their brackets.

8. Remove the two nuts retaining the motor to its bracket and remove the motor.

9. Remove the two screws retaining the transmission assembly to its bracket and disconnect the wires to the transmission and remove the transmission.

Installation

1. Position the transmission assembly to its seat track bracket and install the two retaining screws. Connect the wires at the quick disconnect.

2. Position the motor to its bracket and install the two retaining nuts.

3. Position three drive units on the seat track assembly and install the six retaining screws.

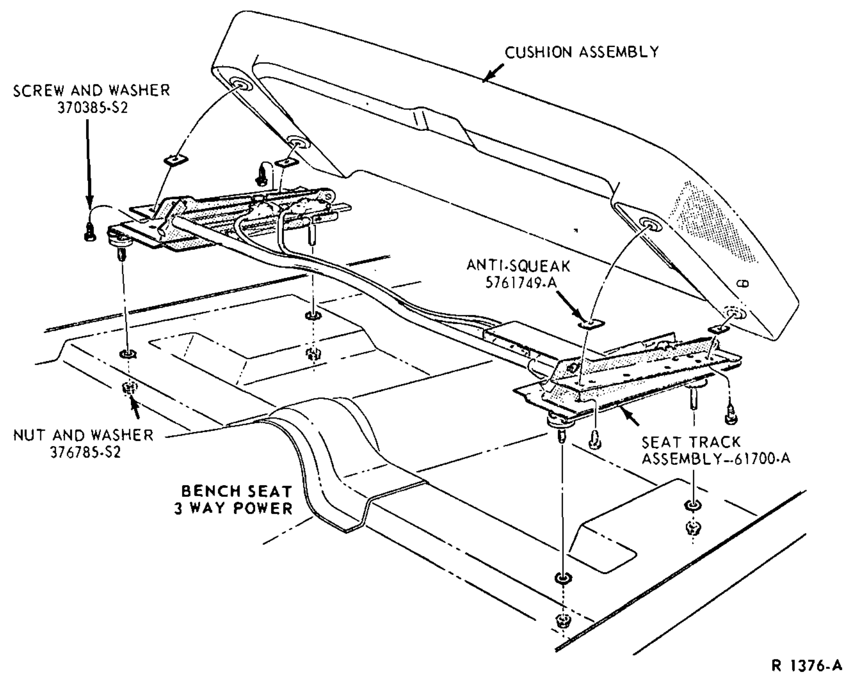


FIG. 13—Power Seat Track—Bench—Mercury Intermediate

4. Install the relays in their brackets.

5. Install the assist springs on the seat tracks.

6. Connect the control switch quick disconnect and position the cushion assembly to the seat track and install the four retaining screws.

7. Place the assembled seat in the vehicle.

8. Connect the wires at the quick disconnect and install the four seat track retaining nuts.

9. Check the operation of the seat.

BUCKET SEAT TRACK— POWER—MERCURY INTERMEDIATE

Removal

1. Remove the four seat track retaining nuts. Disconnect the seat wiring loom at the quick disconnect and remove the seat assembly from the vehicle (Fig. 14).

2. Remove the four bolts retaining the cushion assembly to the seat track and remove the assembly.

3. Disengage the seat track assist spring.

4. Remove the forward and rear drive unit from the track. Unplug the relay wires. Remove the relay retaining screws and remove the relays.

5. Remove the up and down drive unit from the track assembly.

6. Remove the screws retaining the motor and solenoid to the track assembly. Remove the wire and cable clamp and separate the motor and solenoid from the seat track.

Installation

1. Position the motor and solenoid to the seat track and install

the retaining screws. Also install the wire and cable clamps.

2. Install the up and down drive unit to the seat track.

3. Position the relays to the track assembly and install the retaining screws. Connect the relay wires.

4. Install the forward and rear drive unit to the seat track. Position and engage the seat track assist spring.

5. Position the cushion assembly to the seat track and install the four retaining bolts.

6. Position the seat assembly in the vehicle and connect the seat wiring loom. Install the four seat track retaining nuts.

7. Check the operation of the seat.

POWER SEAT MOTOR —BENCH—MERCURY INTERMEDIATE

Removal

1. Remove the four seat retaining nuts and disconnect the main wiring loom disconnect and tilt the seat assembly backwards.

2. Disconnect the two push on connector at the seat track transmission assembly. Remove the two bolts retaining the transmission to the bracket and position the transmission and drive block to the side.

3. Disconnect the plugs to the motor assembly. Remove the two nuts retaining the motor to the mounting bracket and remove the motor.

Installation

1. Position the motor to the mounting bracket and install the two retaining nuts. Connect the plugs to the motor assembly.

2. Position the transmission and drive block to the motor and bracket and install the two retaining bolts. Connect the two push on connectors.

3. Connect the main wiring loom connector. Position the seat assembly to the floor and install the four retaining nuts.

4. Check the operation of the seat.

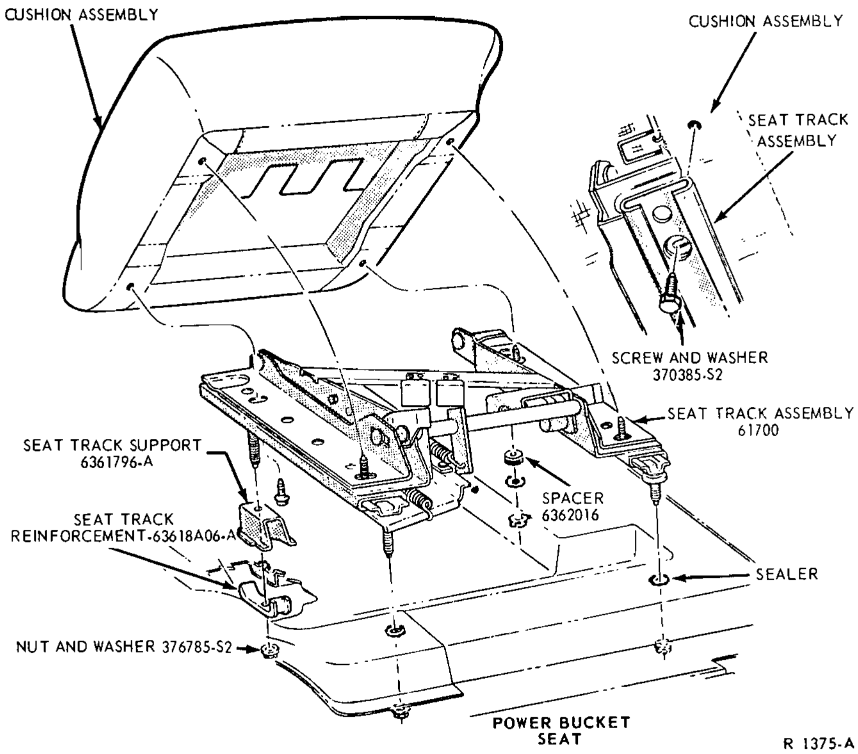


FIG. 14—Power Seat Track—Bucket—Mercury Intermediate

4 SEAT BELTS AND SHOULDER STRAPS

SEAT BELTS

The seat belts are factory installed in their proper locations. If the belts are removed for any reason, they should be installed as shown in Figs. 15, 16 and 17. Sealer should be placed around the rear seat belt anchor bolt holes in the floor pan.

SHOULDER STRAPS

The shoulder strap installation is shown in Figs. 18 and 19. When attaching the lower part of the shoulder strap to the floor pan, place sealer around the anchor bolt hole as shown in View BB. Tighten all bolts to the torque specified in Figs. 18 and 19.

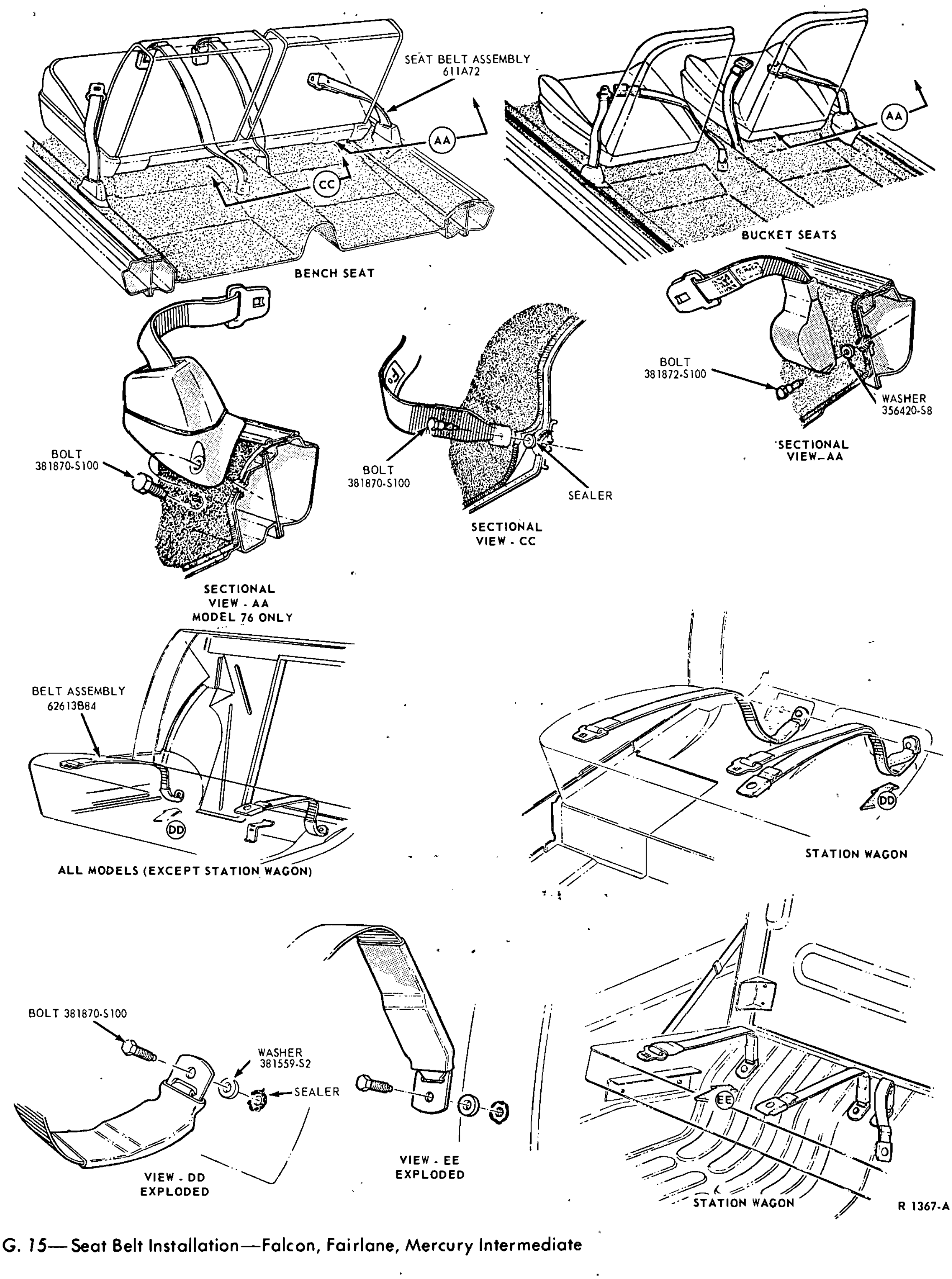


FIG. 15—Seat Belt Installation—Falcon, Fairlane, Mercury Intermediate

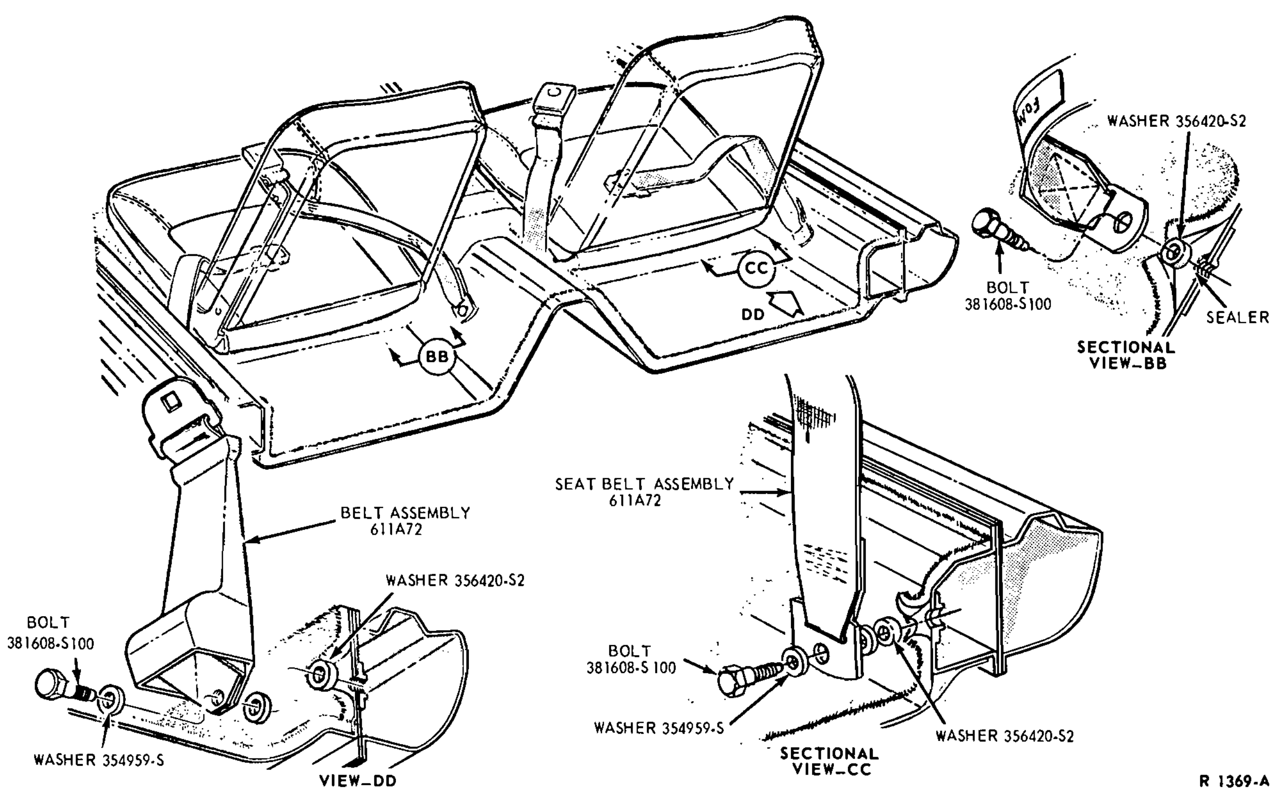


FIG. 16—Front Seat Belt Installation—Mustang and Cougar

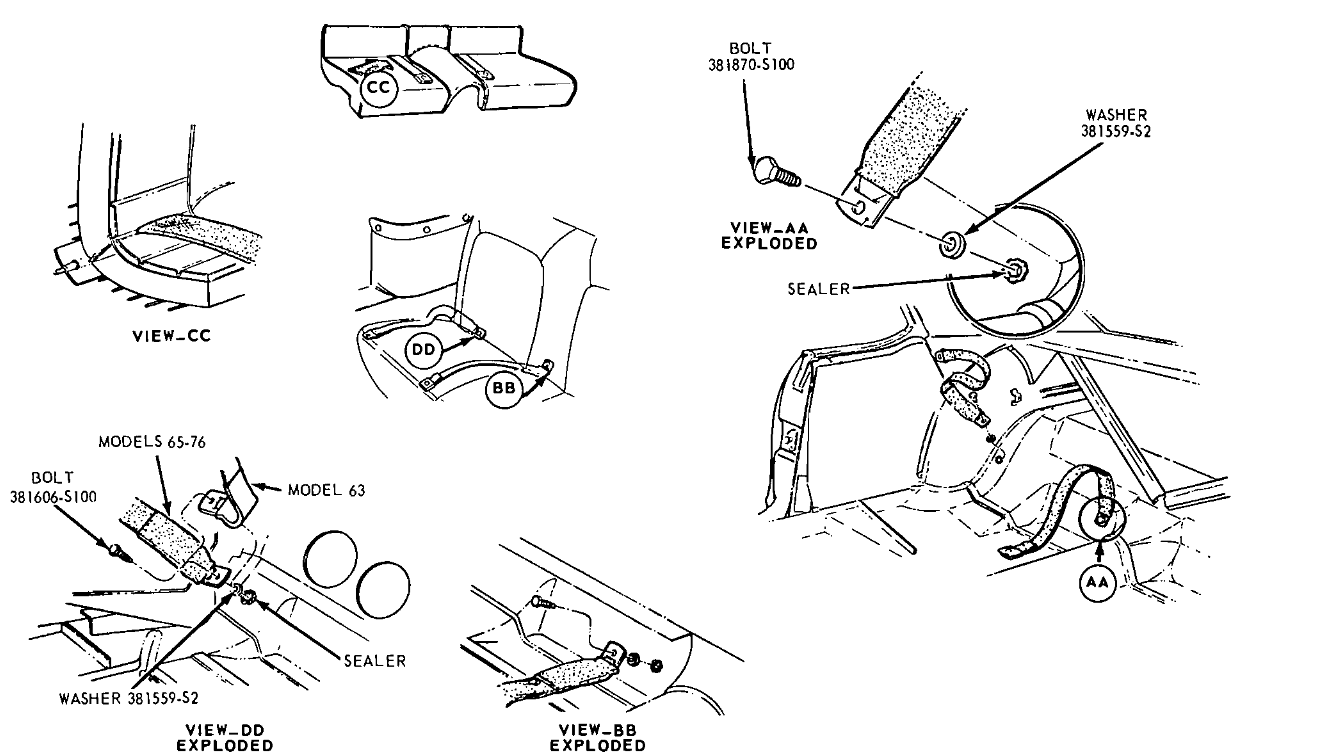


FIG. 17—Rear Seat Belt Installation—Mustang and Cougar

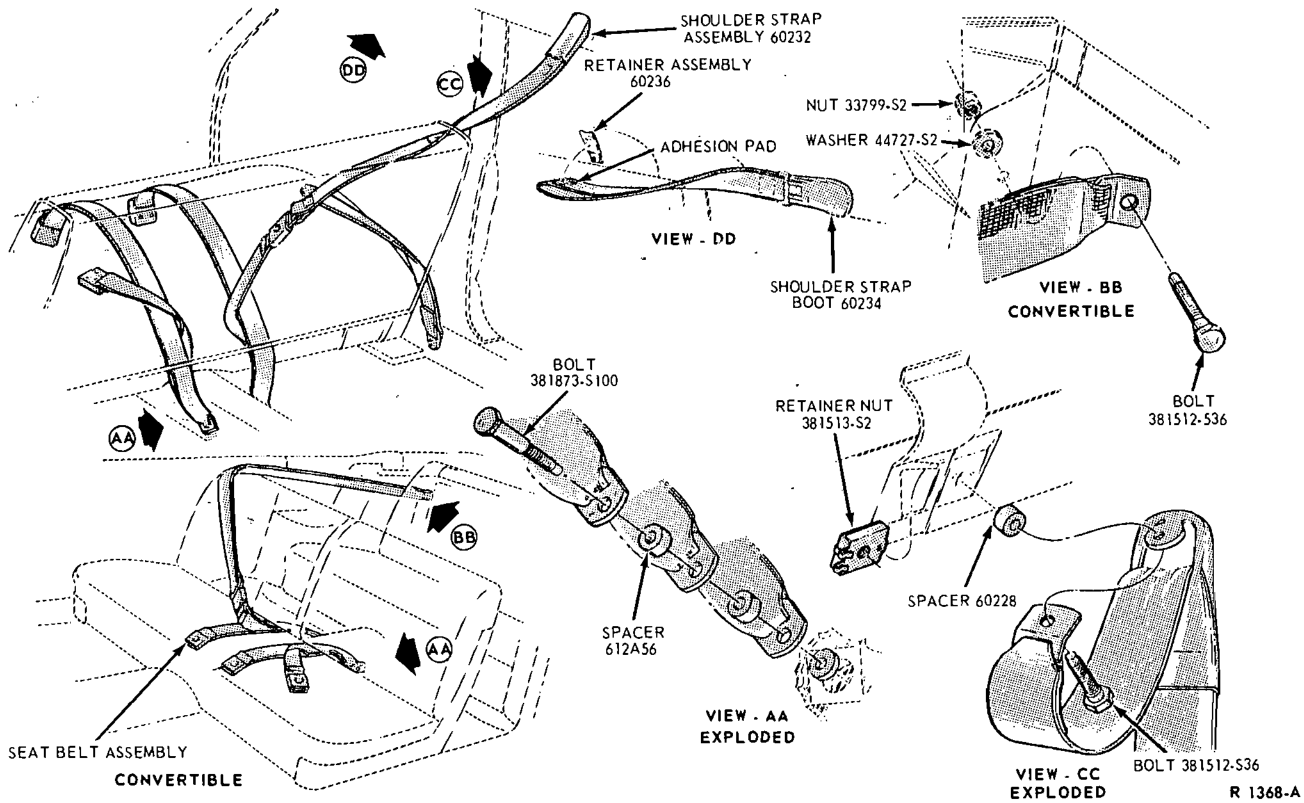


FIG. 18—Shoulder Strap Installation—Falcon, Fairlane, Mercury Intermediate

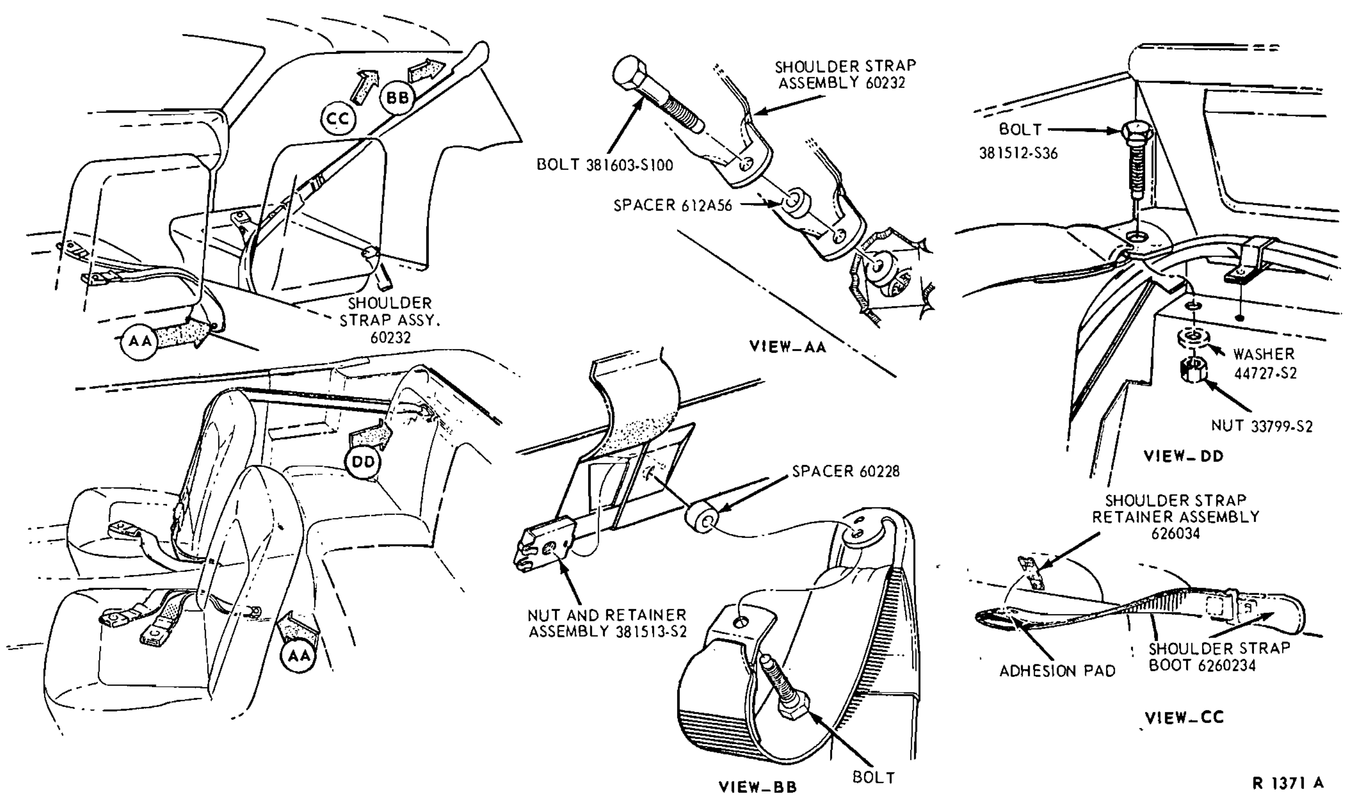


FIG. 19—Shoulder Strap Installation—Mustang and Cougar

PART 18-3— Convertible Top

1 CARE OF TOP FABRIC

Proper care of the top material will reduce the possibility of water stains, mildew, or shrinkage. Do not stack the top if it is damp. Always use the convertible top vinyl boot to keep the top material clean, dry, and positioned when the top is stacked.

The rear window slide fastener should be lubricated at least once a year with stainless stick lubricant.

Use the top compartment behind the rear seat back only for storage of the top. The storage of other items not only interferes with the proper operation of the top, but may also damage or stain the top material.

The vinyl top may be washed each time the car is washed. Clean the material with FoMoCo Interior Trim Cleaner and a scrub brush. Be sure to rinse the top thoroughly with clean water during and after washing.

Do not use a cleaning material that is not recommended for vinyl material because damage to the top may result.

The vinyl coating becomes tacky at approximately 180° F. Therefore, when making paint repairs, be sure to protect the top material from heat.

2 DIAGNOSIS AND TESTING—POWER TOP

Refer to Wiring Diagram Manual Form 7795P-67 for locations of wiring harnesses. Schematics are shown in Group 19 of this manual.

If the top cannot be lowered or raised satisfactorily, or if it fails to operate at all, and the trouble is not readily apparent, make the following mechanical, electrical, and hydraulic tests to find the cause of the trouble. **Always check the battery before making any of the following checks.**

Fig. 18 shows symptoms and possible causes of trouble.

MECHANICAL CHECKS

1. If the action of the top is slow, raise and lower it and look for bent or misaligned linkage.
2. If binding is noted when clamping the top at the header, check the alignment of the door and the quarter windows with the side rail weatherstrips. Also check the top sag adjustment and toggle clamp adjustment.

ELECTRICAL TESTS

BATTERY CHARGE

The battery charge should be determined before making any electrical checks because a partially discharged battery will cause slow motor and pump operation.

CURRENT DRAW

To check the current draw in the top operating circuit, disconnect the black wire at the circuit breaker (located on the starter relay), and connect an ammeter in series in the circuit. Operate the top control switch and note the ammeter readings. The current draw should be 28 amperes maximum operating. Current in excess of 75 amperes indicates a frozen pump or cylinder or a mechanical obstruction. Low amperage with the motor running and no top movement indicates a defective pump or low fluid level in the reservoir.

TOP CONTROL SWITCH

1. Disconnect the wiring harness at the switch multiple connector located behind the instrument panel.
2. Connect one terminal of a test

lamp to the black (feed) wire of the top control switch, and ground the other lead. If the test lamp does not light, there is an open or short circuit between the battery and the switch or a bad circuit breaker.

3. If there is voltage to the switch, connect a jumper wire between the black (feed) wire and the red wire, and then between the black wire and the yellow wire. If the top motor operates, the switch is faulty and must be replaced.

CIRCUIT BREAKER

If there is no voltage at the top control switch, connect a jumper wire across the terminals of the circuit breaker (located on the starter relay) and operate the switch. If the top motor operates, the circuit breaker is faulty and must be replaced. If there is no voltage at the circuit breaker, check the black wire from the circuit breaker to the starter relay.

SWITCH—TO—MOTOR WIRES

Disconnect the yellow and the red switch-to-motor leads at the junction block near the motor. Connect a 12-volt test lamp between the yellow wire and a ground and check by operating the top control switch to raise the top. Connect the test lamp between the red wire and a ground, and check by operating the switch to lower the top. If the test lamp does not light in either case, the wire from the junction block to the switch is open or shorted.

MOTOR

Check the operation of the motor by connecting first one motor lead, and then the other, directly to the battery positive terminal. If the motor operates in either case, but will not operate when hooked into the wiring harness, check the wiring harness again for short or open circuits. If the motor will not work when hooked directly to the battery, check the black (ground) wire from the motor. If the motor still does not work, it must be replaced.

HYDRAULIC TESTS

Faulty hydraulic system operation can be caused by lack of fluid, leaks, air in the system, obstructions or kinks in the hoses, or faulty operation of the cylinder or the pump.

FLUID LEVEL

1. Remove the rear seat and raise the top.
2. Place absorbent cloths below the filler plug.
3. Remove the filler plug, and check the fluid level. It should be level with the bottom edge of the hole.
4. If the level is low, check the system for leaks, adding automatic transmission fluid C1AZ-19582-A as necessary.

LIFT CYLINDER

Remove the rear seat and the quarter trim panels, operate the top control switch, and check the operation of the lift cylinders for the following:

If the movement of the piston rods are sluggish or uneven, check the hoses from the pump to the cylinders for kinks.

If one piston rod moves slower than the other, the cylinder with the slower rod is defective and should be replaced.

If both rods move slowly, or do not move at all, disassemble and repair the pump.

3 ADJUSTMENTS AND LIGHT REPAIRS

Before aligning the top, visually determine if the trouble results from top misalignment and/or window misalignment. It may be necessary to align both the top and the windows because of the relationship between the two. Adjustments of the door and quarter windows must be checked and any necessary changes made before making top adjustments. These windows must be fully closed to insure proper top adjustment. Door window and quarter window adjustments are outlined in Part 17-3.

FOLDING TOP ADJUSTMENTS —MERCURY INTERMEDIATE AND FAIRLANE

The top assembly must be in the up position with the door and quarter windows in the fully raised position (Fig. 1).

1. Loosen the screw and washer assemblies (Fig. 1, item A), and adjust the bracket (item B, part of the top assembly) inboard or outboard to obtain the 19/64-inch clearance dimension between the rear side rail and the belt side moulding. The bracket must be adjusted and secured in a vertical position. Tighten the screw and washer assemblies.

2. To maintain the correct design relationship between the rails and glass, the set screw (item W, Fig. 1) must be adjusted as follows: With the top up and not latched, the front and center rails should be made to maintain a continuous curve which matches the curve of the top of the side glass when pressure is applied upward under the hinge.

3. Loosen the nut (item C, Fig. 1) and rotate the cam pin (item D) to obtain the 1/2-inch parallel dimension between the rails and door glass, and between the rear rail and quarter glass. The mark on the cam pin must not be rotated more than 90° rearward of the mean adjustment mark on the rail, and should be rotated as far toward the front of the car as possible when the top is up and latched. Hold the cam pin (item D) and torque the nut (item C) to 2-5 ft-lbs. **If the dowel (item E) does not line up with the sun visor bracket dowel hole on a fore and aft line, the top cloth is to be removed from the No. 1 bow. Loosen 2 screws (item F). Then, the top cloth should be tacked and cemented. In some cases, the No. 1 bow can be adjusted to a small degree (1/16 inch) without removing and tacking the top cloth.**

4. Door and quarter windows must be adjusted. Door window and quarter window adjustments are outlined in Part 17-3.

5. Loosen the nut (item G) and adjust the dowel (item E) inboard or outboard to center the dowel in the sun visor bracket dowel hole. Then, tighten the nut.

6. To maintain a proper design relationship between the No. 1 bow and header, loosen the set screw (item H) and rotate the hook (item J) in or out. Then, tighten the set screw.

7. If interference is encountered between the top cloth and the top of the door glass frame when the door is opened, the No. 2 bow and/or No. 3 bow can be adjusted by loosening the nuts (item K and L) and raising the bows. After adjustment, tighten the nuts.

8. Operate the folding top assembly one complete cycle and recheck.

MUSTANG TOP ADJUSTMENTS

SIDE RAIL WEATHERSTRIPS ADJUSTMENT

The rear and center side rail weatherstrips are adjustable fore and

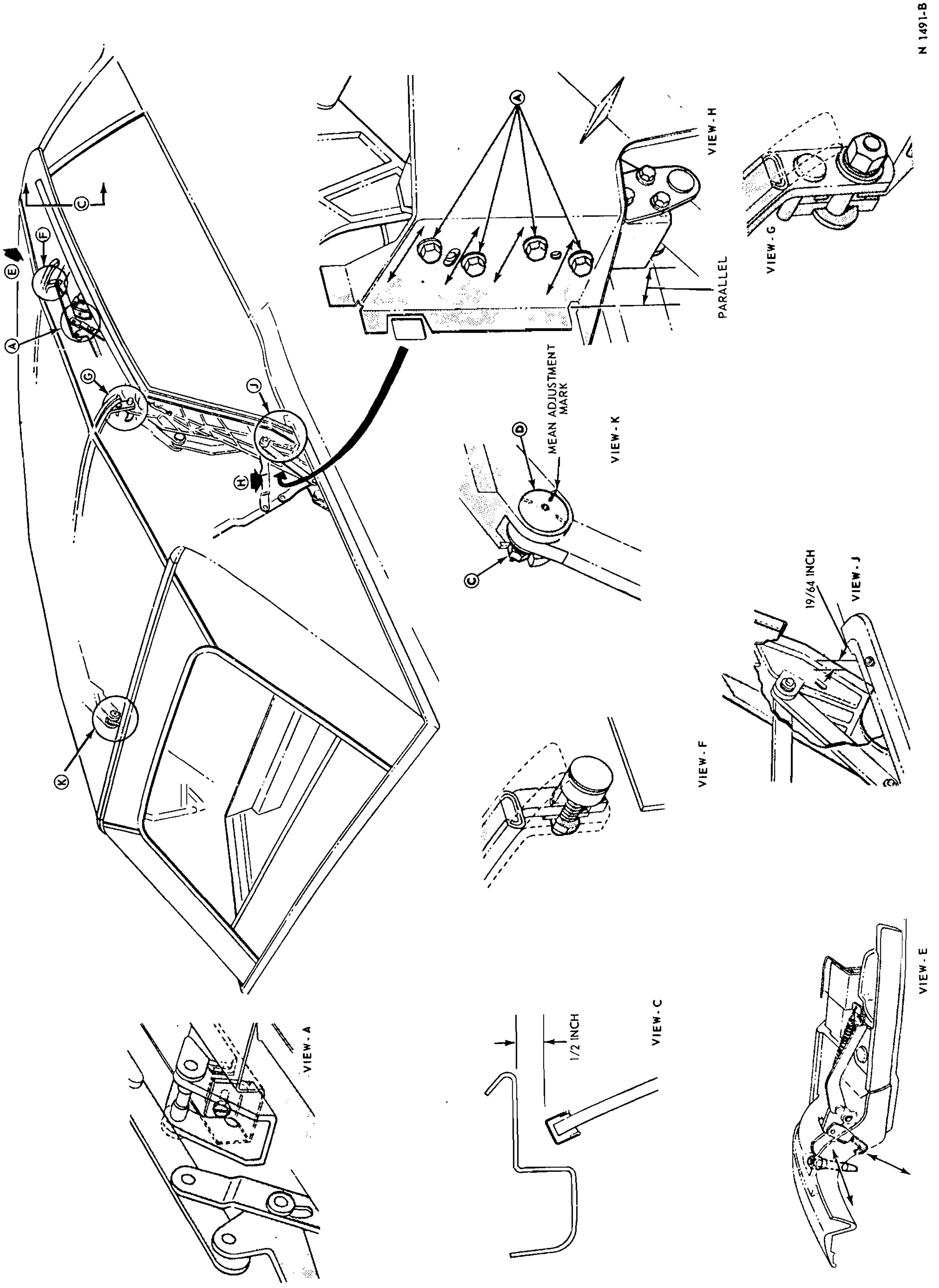


FIG. 1—Mercury Intermediate, Fairlane Top Adjustments

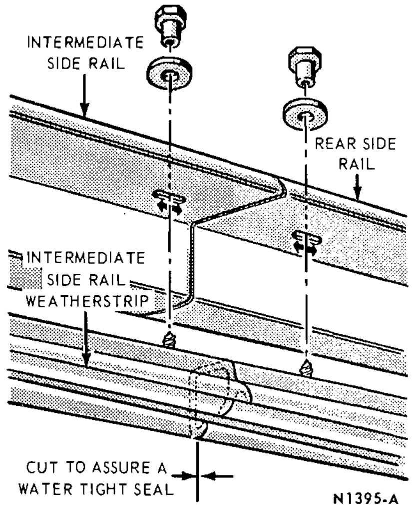


FIG. 2—Side Rail Weatherstrip Adjustment—Mustang

aft to provide a good seal at the break joints. The front weatherstrip is not adjustable.

1. Lock the top assembly to the windshield header.

2. Trim the rear edge of the front top side rail weatherstrip flush with the rear end of the front side rail to

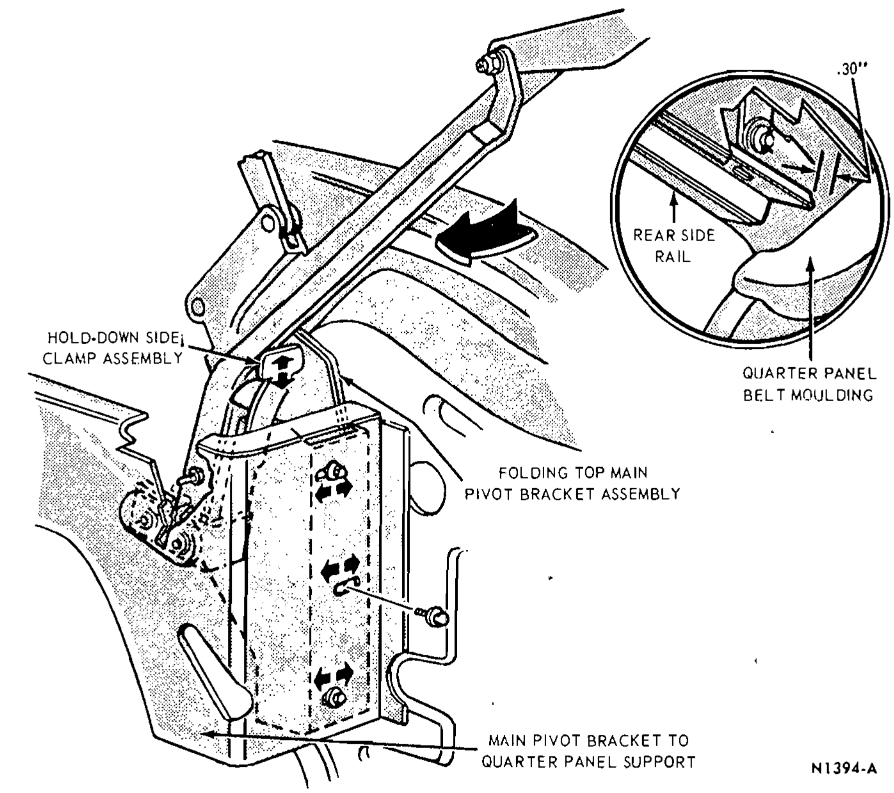


FIG. 3—Main Pivot Bracket Adjustment—Mustang

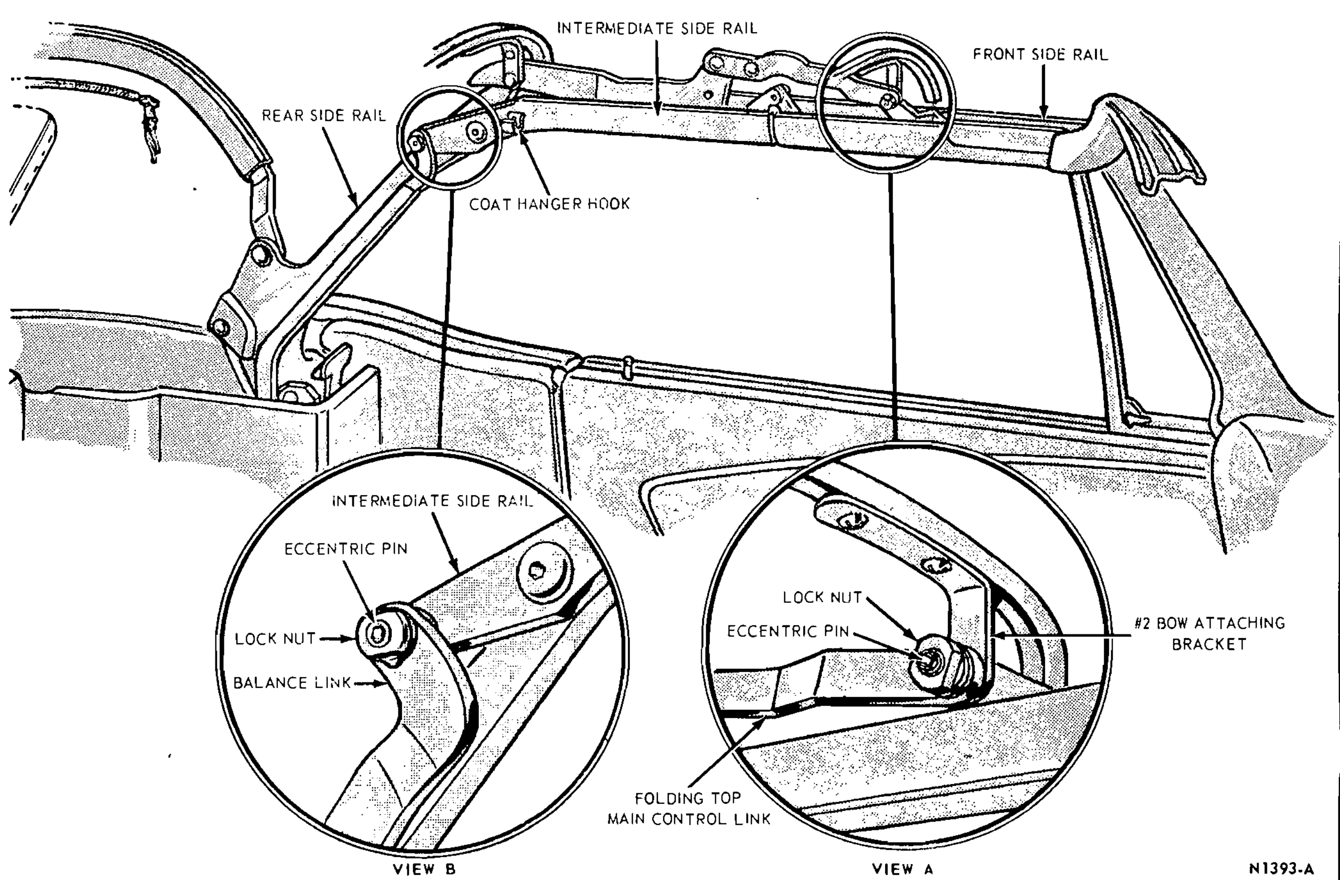


FIG. 4—Top Side Rail Adjustments—Mustang

obtain a water tight seal at point X (Fig. 2).

3. Adjust the rear side rail weatherstrip to provide a water tight seal at the joint (Fig. 2), and tighten the weatherstrip retaining nuts.

LATERAL ADJUSTMENT

This adjustment shifts the top assembly sidewise to obtain a good fit between the rear side rail and the quarter outside rear side belt moulding.

1. Loosen the screws which retain the main pivot bracket to its support (Fig. 3).

2. Shift the main pivot bracket toward either side as necessary to obtain the proper clearance (9/32 inch) between the rear side rail and the quarter outside rear side belt mouldings and tighten the retaining screws.

INTERMEDIATE SIDE RAIL ADJUSTMENT

This adjustment moves the top assembly to obtain a good fit between the top assembly and the side window glass line.

1. With the door glass properly adjusted, loosen the eccentric nut (View B, Fig. 4), and rotate the eccentric pin to obtain a 3/8-inch parallel dimension between the front door glass and the front and center side rails.

2. Hold the eccentric pin to prevent it from turning, and tighten the eccentric nut. **The main balance link marking and washer pointer is an average dimension of adjustment. Rotation of the eccentric with raise or lower the side rails to obtain the correct design-height dimension between the side rails and the glass.**

BALANCE LINK ADJUSTMENT

The balance link is retained to the intermediate side rail assembly with an eccentric pin (Fig. 4, View B). Rotation of the eccentric pin raises or lowers the side rail over the door glass area. Clearance between the glass frame and side rail is 3/8 inch constant.

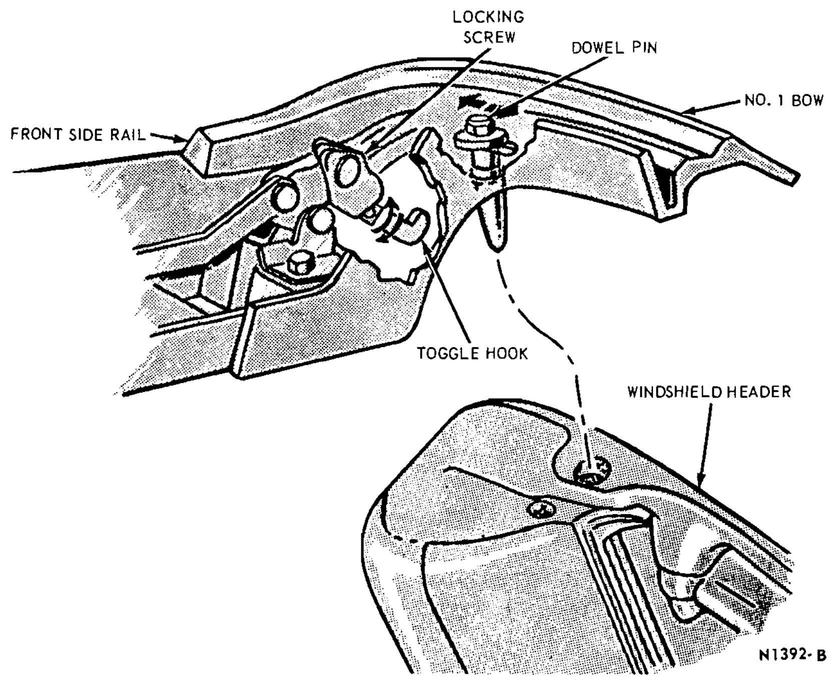


FIG. 5—Toggle Clamp Hook and Dowel Adjustment—Mustang

TOGGLE CLAMP ADJUSTMENT

The toggle clamps that hold the No. 1 bow against the header can be adjusted to provide a good seal.

1. To determine which side is not sealing, check the weatherstrip between the No. 1 bow and the header with a 3 x 5-inch card. A reasonable pull must be felt as the card is pulled out. Both toggle clamps need not be adjusted unless necessary.

2. Release the toggle clamps (Fig. 5), loosen the Allen screw, and thread the toggle hook in or out until adequate sealing pressure is applied at the header weatherstrip. **Excessive tightening of the toggle hooks will distort the No. 1 bow and cause poor weatherstrip sealing.** Tighten the Allen screw after adjusting the clamp.

DOWEL PIN ADJUSTMENT

To obtain proper alignment of the dowel pins with the dowel pin holes in the windshield header, loosen the dowel pin retaining nut (Fig. 5) and move the dowel pins inboard or outboard. Then, tighten the dowel retaining nut.

NO. 2 BOW ADJUSTMENT

Raise the top and lock it to the windshield header. Loosen the lock nut (View A—Fig. 4), and rotate the eccentric pin to raise or lower the top material along the door glass line. The specified clearance for the top material to door glass frame is 1/8 inch. Hold the eccentric and tighten the lock nut.

HOLD DOWN SIDE CLAMPS—MANUAL TOP

The hold down side clamp assemblies located on each quarter panel support mounting (Fig. 3), are adjustable up and down to retain the top assembly when in its fully stacked position.

4 REMOVAL AND INSTALLATION

MOTOR AND PUMP—POWER TOP

A pump repair kit and a reservoir repair kit are available for service.

REMOVAL

1. Operate the top to the fully raised position.

2. Open the deck lid and cover the luggage compartment floor.

3. Remove the two screws retaining the rear folding top compartment support wire retaining clips and remove the clips.

4. Disconnect the motor leads and the ground wire.

5. Remove the attaching nuts, and remove the motor and pump assembly from the floor pan. Do not lose the rubber grommets.

6. Vent the reservoir by removing the filler plug, and then install the filler plug. **The reservoir must be vented in order to equalize the pressure. This lessens the possibility of fluid spraying on the trim and paint when the hoses are disconnected.**

7. Place absorbent cloths beneath the hose connections, disconnect the hoses, and then plug the open fittings and lines.

DISASSEMBLY

1. Remove the filler plug, and drain the fluid from the reservoir into a clean container.

2. Scribe lines on the reservoir and pump body so that these parts can be positioned properly upon assembly.

3. Remove the center bolt from the reservoir cover (Fig. 6).

4. Remove the reservoir cover and the O-ring seal from the pump.

5. Remove the mounting bolts that hold the valve body to the pump body.

6. Place a cloth under the assembly, and carefully remove the valve body so that the check balls are not lost.

7. Remove the inner and outer rotors and the drive ball.

ASSEMBLY

Use all the parts contained in the pump repair kit when assembling the pump or reservoir.

1. Install the inner rotor on the armature shaft and position the drive ball.

2. Install the outer rotor over the inner rotor.

3. Place the check balls in the motor body channels.

4. Install the valve body on the motor body.

5. Install the five valve body mounting bolts.

6. Install the O-ring seal on the valve body.

7. Install a new seal on the center bolt, and install the reservoir cover on the valve body, using the line previously scribed as a guide.

8. Place the assembly in a horizontal position, fill the reservoir with automatic transmission fluid, C1AZ-19582-A to the level of the bottom of the filler plug hole. Install the filler plug and a new seal.

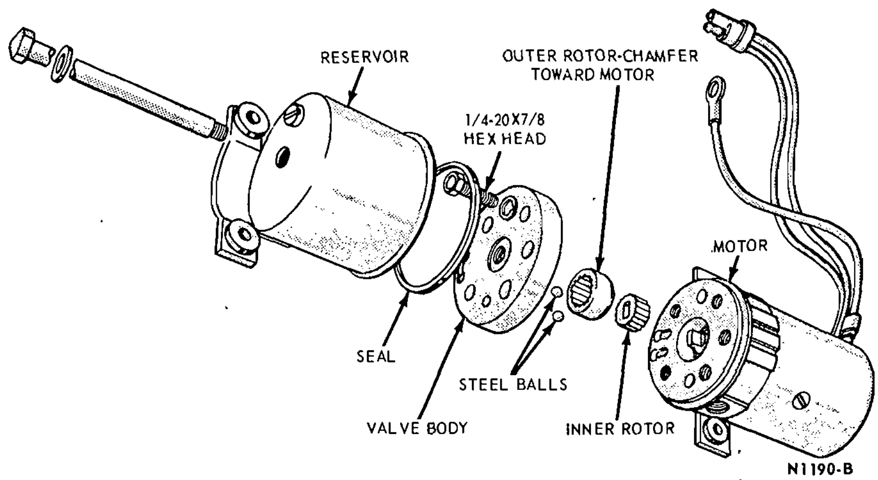


FIG. 6—Motor and Pump Disassembled

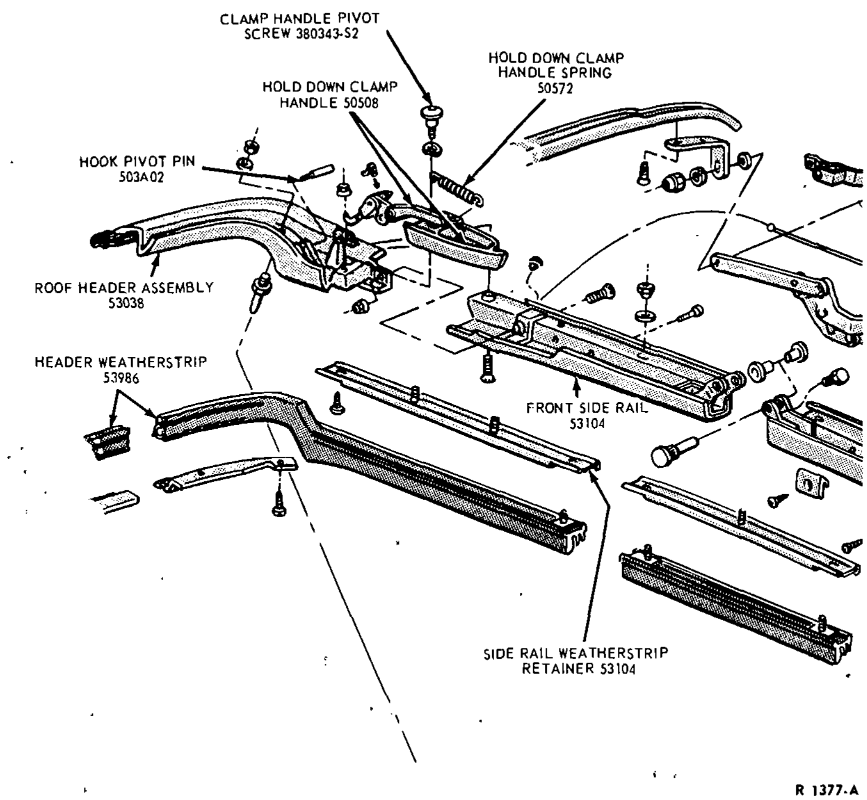


FIG. 7—Folding Top Hold Down Clamp—Fairlane, Mercury Intermediate

INSTALLATION

1. Remove the plugs from the lines and fittings, and connect the lines to the pump. Use cloths to absorb any fluid that leaks out of the lines or the pump.

2. Install the assembly on the floor pan, making sure that the rubber grommets are in proper position under the mounting brackets.

3. Connect the motor lead wires at the connector, and connect the ground wire.

4. Operate the top assembly two or three times to bleed any air from the system, and check the fluid level in the reservoir. The fluid level should not be less than 1/4 inch below the filler plug opening. **The top must be up when the fluid level is checked.**

5. Position the retaining clips on the rear folding top compartment support wire and install the retaining screws.

6. Remove the covers from the luggage compartment floor and close the deck lid.

ROOF HOLD DOWN CLAMP—FAIRLANE, MERCURY INTERMEDIATE

REMOVAL

1. Lower the top.
2. Remove the three tee nuts and one screw retaining the front side rail weatherstrip and retainer to the side rail (Fig. 7).
3. Remove one screw from the corner of the header weatherstrip retainer and position the front side rail weatherstrip and retainer out of the way.
4. Unhook and remove the hold down clamp handle spring.
5. Remove the pivot screw from the clamp handle.
6. Remove the hook pivot pin from the roof header and remove the hold down clamp assembly from the header and side rail.

INSTALLATION

1. Position the clamp assembly to the roof header and side rail.
2. Install the hook pivot pin and handle pivot screw.
3. Install the hold down handle clamp spring.
4. Position the front side rail weatherstrip and retainer to the side rail and install the retaining nuts and screw.
5. Position the weatherstrip to the roof header and install the retaining screw.
6. Lower the top and check the operation of the latch and adjust the latch as necessary.

LIFT CYLINDER—POWER TOP

1. Remove the rear seats and quarter trim panel.
2. Remove the hairpin clip, washer, and clevis pin from the upper end of the cylinder.
3. Remove the mounting bolts, bracket, and bushings from the cylinder.
4. Pull the cylinder down; place absorbent cloths below the hose connections; disconnect the hydraulic lines, and remove the cylinder.
5. Install the hydraulic lines on the new cylinder and install the cylinder bushings, mounting bracket, and bolts.
6. Install the clevis pin, washer, and hairpin at the upper end of the cylinder.
7. Operate the top assembly two or three times to bleed any air from the system, and check the fluid level in the reservoir. The fluid level should not be less than 1/4 inch below the filler plug opening. **The top must be up when the fluid level is checked.**
8. Install the quarter trim panel and rear seats.

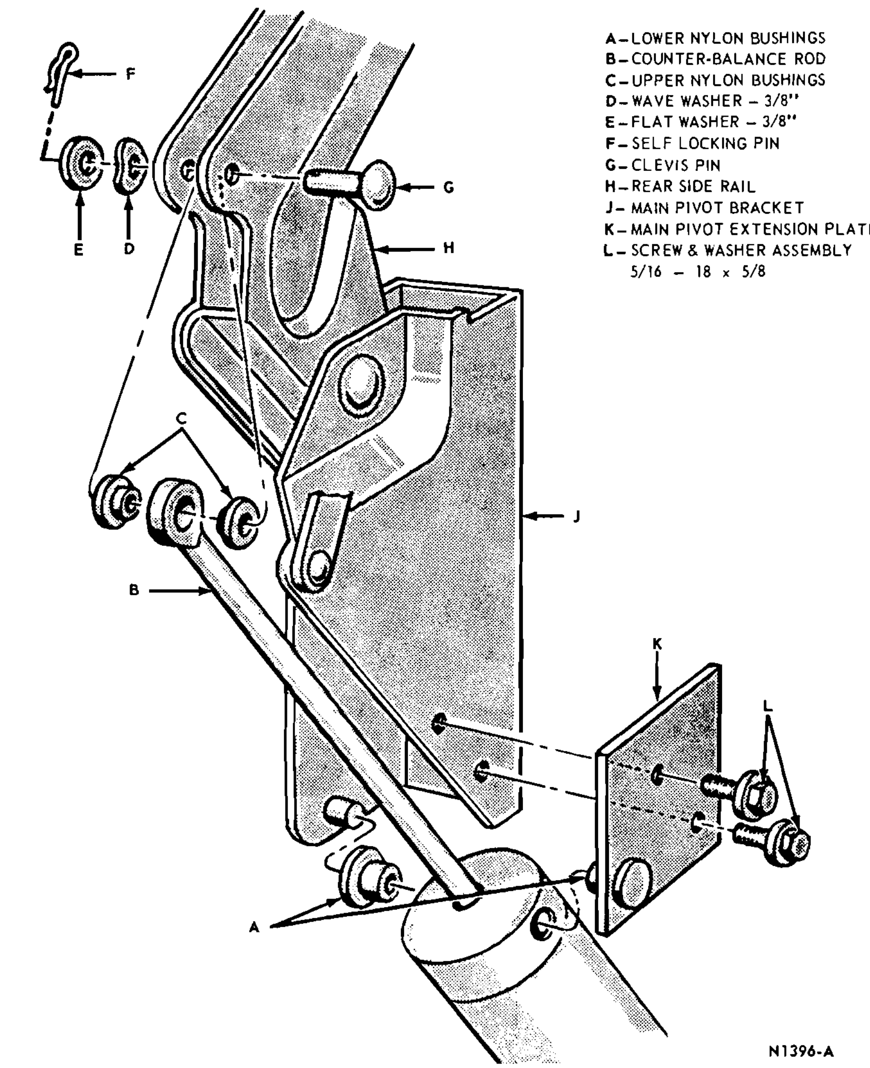


FIG. 8—Counterbalance Cylinder Installation—Mustang

COUNTERBALANCE CYLINDER—MUSTANG MANUAL TOP

REMOVAL

1. Raise the top. **Do not attempt to remove the counterbalance cylinder with the top in the lowered (stacked) position.**
2. Remove the rear seat cushion and seat back.
3. Remove the quarter trim panels.
4. Remove the self locking pin F, Flat washer E, wave washers, and clevis pin G (Fig. 8). Disengage the counterbalance rod B from the rear side rail H (Fig. 8).
5. Remove the two bolts L and the main pivot extension plate K from the main pivot bracket J (Fig. 8), and remove the counterbalance spring assembly. Keep the upper and lower nylon bushings A and C for re-use if serviceable.

INSTALLATION

1. Position the counterbalance spring in place and install the main pivot bracket.
2. Install the counterbalance rod retaining pin and washers.
3. Install the quarter trim panel.
4. Install the rear seat back and seat cushion.

BACK CURTAIN

MERCURY INTERMEDIATE, FAIRLANE

1. Unfasten the clamps that hold the top to the windshield header.

2. Remove the retainer pins retaining the folding top rear compartment trim to the tacking strips and position the trim away from the tacking strips.
3. Remove the bolts and lock washers that retain the curtain tacking strip to the body panel.
4. Open the back curtain window slide fastener and remove the curtain assembly.
5. Pull the tacking strips from the curtain and remove the staples from the tacking strip (Fig. 9).
6. Remove the tacking strip lock screws from the tacking strips.
7. Properly position the curtain and staple it securely to the tacking strip.
8. Staple the side tacking strips to the curtain.
9. Position the curtain assembly to the body panel, and loosely install the belt tacking strip retaining bolts and lock washers.
10. Close the curtain window slide fastener.
11. To adjust the curtain window tension and remove wrinkles, tighten or loosen the tacking strip retaining bolts as required. After adjusting the curtain, install and tighten the tacking strip lock screws until they bottom against the body panel.
12. Reposition the folding top rear compartment trim and install the retainer pins.

MUSTANG

1. Unhook the top from the windshield header and prop the top up to relieve tension.
2. Unzip the back curtain.
3. Remove 3 screws retaining each side of the top compartment trim at the quarter panel.
4. Remove 5 screws attaching the top compartment trim to the rear seat and remove the compartment trim tension springs (Fig. 10).
5. To assure the proper location of the back curtain assembly during installation, the following location marks should be made with tailor's crayon or equivalent:

Locate the center punch mark on the belt center tacking strip retainer (Fig. 13, View A-A). Transpose this center mark to the adjacent rear curtain and compartment trim materials.

Mark the rear curtain along the lower edge of the belt center tacking strip (Fig. 13, View BB and CC).

Mark the belt center tacking strip to indicate the rear window opening at both sides (Fig. 13, View BB).

6. Pull the top compartment trim back and remove 8 bolts retaining

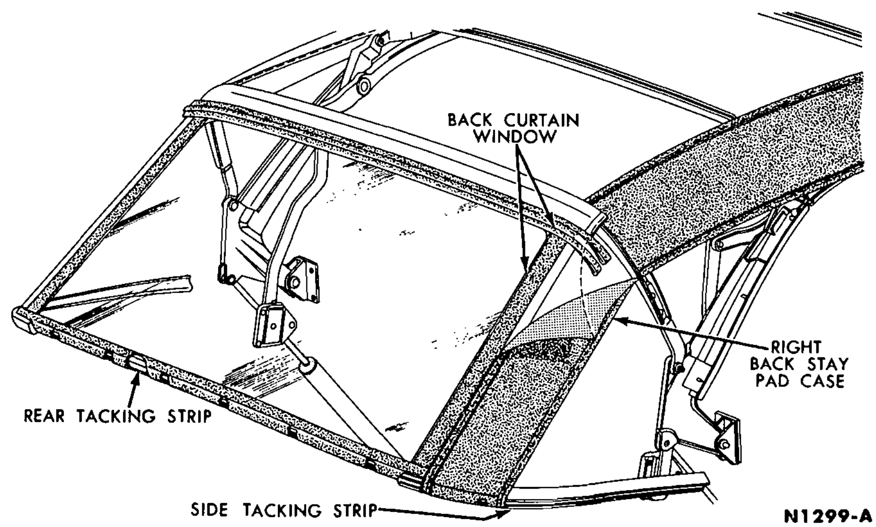


FIG. 9—Back Curtain—Mercury Intermediate, Fairlane

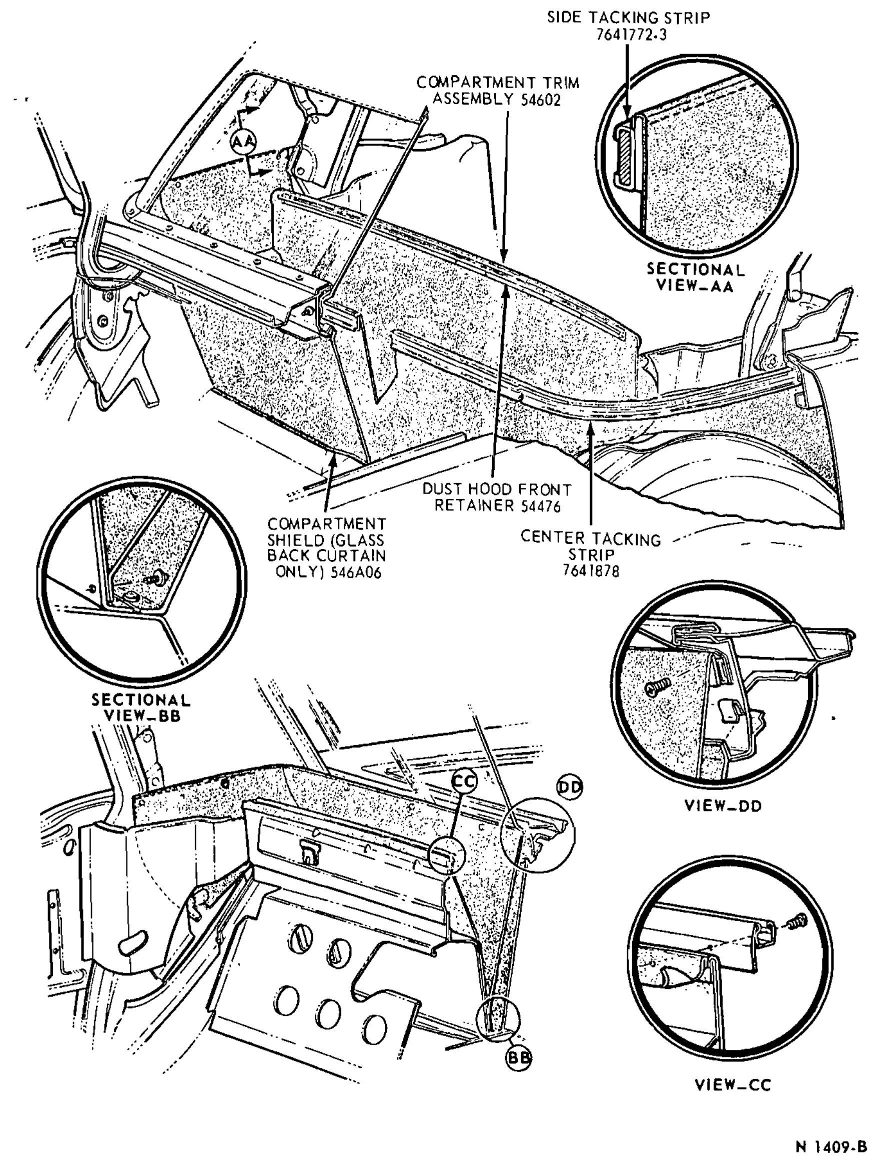


FIG. 10—Back Curtain Installation—Mustang

the back curtain and the center tacking strip.

7. Remove the staples from the webbing and the top quarter from the tacking strip. Remove the back window, top compartment trim, and the tacking strip, as an assembly, from the car.

8. Remove the back curtain from the tacking strip and position the new back curtain to the tacking strip. Cut out the bolt hole locations on the back curtain.

9. Position the back curtain assembly into the car and tack the webbing and quarter assembly to the tacking strip. Then, zip the back curtain shut.

10. Remove the prop from the top and secure the top to the windshield header.

11. Install and tighten the tacking strip attaching bolts.

12. Install the top compartment trim quarter and seat back retaining screws. Clean the top in the rear roof bow area with a suitable cleaner.

BACK CURTAIN ZIPPER

MERCURY INTERMEDIATE, FAIRLANE

1. Unhook the top from the windshield header and prop the top up to relieve tension.

2. Unzip the back curtain.

3. Remove the retainer pins retaining the folding top rear compartment trim to the tacking strips and position the trim away from the tacking strips.

4. Remove the bolts and flat washers that retain the curtain tacking strip to the body panel, and remove the back curtain.

5. Mark the zipper location on the back curtain, then, remove the zipper from the back curtain and sew on a new zipper.

6. Remove the bolts and flat washers that retain the side belt tacking strips to the body.

7. Remove the rear bow binding end cap; slide out the binding insert and remove the staples and retainer.

8. Remove the staples retaining the top deck and quarter assembly to the rear bow.

9. Remove the staples retaining the top right and left back stay pad case assemblies to the rear roof bow.

10. Remove the staples retaining the zipper to the rear bow tacking strip and remove the zipper.

11. Position the upper half of the back curtain zipper to the center of the rear roof bow tacking strip. Staple or tack it securely to the tacking strip.

12. Staple the top left and right back stay pad case assemblies to the rear bow tacking strip. Seal the unused holes in the top material.

13. Staple the top deck and quarter assembly to the rear bow tacking strip.

14. Staple the binding in position, and install the binding end caps.

15. Position the side belt tacking strips to the body and install the retaining bolts.

16. Position the back curtain in the car and install the retaining bolts.

17. Zip the curtain shut and remove the prop from the top. Then, lock the top to the windshield header.

18. Tighten or loosen the tacking strip retaining bolts as required to adjust the curtain tension and remove wrinkles.

19. Reposition the folding top rear compartment trim and install the retainer pins.

MUSTANG

1. Unhook the top from the windshield header and prop the top up to relieve tension.

2. Unzip the back curtain.

3. Remove the rear roof bow retainer tips and pull the outside moulding from the rear bow.

4. Remove the staples retaining the top deck and quarter assembly to the rear roof bow tacking strip and remove the retainer.

5. Mark the location of the right and left case assembly, at the roof bow, then, remove the staples retaining the right and left case assembly to the rear roof bow.

6. Mark the location of the zipper center at the rear roof bow with tailor's crayon. Then, pull the upper half of the back curtain zipper from the rear roof bow tacking strip.

7. Remove 3 screws retaining the top compartment trim to the belt front side tacking strip on each side. Remove 5 screws retaining the compartment trim to the seat back (Fig. 10). Remove the top compartment trim tension springs.

8. Pull the top compartment trim back and remove 8 bolts retaining the center tacking strip. Mark the zipper end locations on the top material with tailor's crayon.

9. Remove the staples from the webbing and the top quarter from the tacking strip. Remove the back curtain, well liner, and tacking strip as an assembly from the car.

10. Mark the location of the zipper on the back curtain, then, remove the zipper from the back curtain and sew on a new zipper.

11. Locate the center and position the upper half of the back curtain zipper to the center of the rear roof bow tacking strip and staple or tack it securely to the tacking strip.

12. Position the right and left case assemblies to the rear roof bow tacking strip and staple or tack them securely to the tacking strip.

13. Position the top deck and quarter assembly to the rear roof bow tacking strip and staple or tack it securely to the tacking strip, working from the center outward.

14. Staple or tack the rear roof bow retainer securely to the rear roof bow, then, insert the moulding in the retainer.

15. Install the right and left rear roof bow retainer tips (Fig. 13).

16. Position the back curtain in the car and tack the webbing and quarter assembly to the tacking strip.

17. Zip the curtain shut and remove the prop from the top, then, lock the top to the windshield header.

18. Install the center tacking strip bolts and tighten them until all wrinkles are removed from the back curtain and quarters. Then, install the top compartment trim retaining screws.

CONVERTIBLE TOP FABRIC

The convertible top consists of the deck and two side quarters, bonded into one piece of material. The bonded seams eliminate the possibility of leaks and also separation, due to thread deterioration. In most cases it will be advantageous to replace the back curtain when replacing the top fabric.

MERCURY INTERMEDIATE, FAIRLANE

Removal

1. Place a protective cover across the deck, cowl and hood to prevent scratching the finish when replacing the top.

2. Remove the rear seat cushion and seat back.

3. Raise the top to gain access to the underside of the front bow.

4. Remove the No. 1 bow weatherstrip retainer (Fig. 11) and the weatherstrip. Remove the windshield header seal.

5. Remove both front side rail weatherstrips and weatherstrip retainers.

6. Remove the two center side rail and the two rear side rail weatherstrips and weatherstrip retainers.

7. Remove the screw and washer that secures each end of the folding

top compartment well to the pivot bracket supports (Fig. 11).

8. Remove the retainer pins retaining the folding top rear compartment trim to the tacking strips and position the trim away from the tacking strips.

9. Remove the tip (Fig. 11) from each end of the moulding on the rear bow. Carefully pull the moulding out of the retainer. Pry the moulding retainer off the bow.

10. To assure the proper location of the tacking strips in the new top assembly, back curtain assembly and/or compartment trim assembly, mark the following locations with tailor's crayon:

Locate and mark the center of the belt center tacking strip retainer. Transpose this center mark to the adjacent rear curtain and compartment trim materials.

Mark the rear curtain along the lower edge of the belt center tacking strip.

Mark the belt center tacking strip to indicate the rear window opening at both sides.

Mark the top deck quarters along the lower edge and at the ends of each belt side front tacking strip.

11. Remove the bolts that attach the top and back curtain tacking strips to the body.

12. Remove the staples that secure the top material to the rear bow.

13. Carefully pull the top material free from the underside of each side rail.

14. Remove the staples that secure the top material to the underside of the front bow.

15. Remove the retainer screws and carefully separate the top from the listings on the No. 2 and 3 bows. Remove the staples that secure the top back stay-pads.

16. Remove the staples that secure the upper end of the back curtain to the rear bow. Remove the curtain.

Installation

1. Remove the tacking strips from the old top and back curtain.

2. Staple them to the new top and back curtain in the same location as they were on the old top.

3. Center the dot on the back curtain with the V mark (center) on the rear bow and staple the upper half of the zipper to the bow. Separate the curtain from the upper half of the zipper.

4. Retack the top back stay pads. Fit the new top on the roof bows.

5. Working from the center outward, staple the top deck to the rear bow. Make sure that the rear section of the slits is stapled to the bow before drawing and stapling the front portion of the slits (Fig. 11).

6. Secure, and tighten the quarter deck tacking strips to the body.

7. Center the top material and pull it forward over the front bow to remove the wrinkles from the top deck and quarters and to align the listings with the No. 2 and 3 bows. While the material is pulled over the front bow, make a reference mark on the material at the leading edge of the bow with a piece of chalk. The mark should extend the entire length of the bow.

8. Raise the top high enough to gain access to the underside of the front bow.

9. Align the reference mark to the leading edge of the bow and staple the material in place. Install the windshield header seal.

10. Install the weatherstrip and the retainers on the No. 1 bow.

11. Secure the flaps to the underside of the side rail with trim cement. Trim the excess material from the flaps.

12. Install the rear, center and the front weatherstrip and retainers on the side rails so that the end of the weatherstrips are in alignment with the side rail joints.

13. Install a piece of tape across the rear bow to cover the staples.

14. Install the moulding retainer, moulding and the two tips on the rear bow.

15. Secure the back curtain to the upper part of the zipper.

16. Secure the back curtain tacking strip in place with the attaching bolts. Tighten the bolts as required working from the center outward to remove all wrinkles.

17. Reposition the folding top rear compartment trim and install the retainer pins.

18. Secure each end of the trim to the pivot bracket supports with a metal screw and washer.

19. Install the rear seat back and cushion.

20. Install listing retainers in the No. 2 and 3 bow listings and install the screws.

21. Remove the protective covers from the deck and the hood.

22. Clean all chalk and reference marks from the top material.

MUSTANG

Removal

1. Protect the painted surfaces of the upper back panel, luggage compartment door and both quarter panels with suitable covers.

2. Fabricate two bow locating gauges to the dimensions shown in Fig. 12.

3. Remove the rear seat cushion and seat back.

4. Remove the top compartment trim side and front attaching screws (Fig. 10).

5. Lower the top and remove the weatherstrip retainer from the No. 1 bow.

6. Remove the front side weatherstrip attaching nuts from both front side rails and remove the weatherstrip assembly (Fig. 13).

7. Remove the windshield header seal assembly, and the top material from the No. 1 bow (Fig. 13).

8. Remove the center and rear side rail weatherstrips (Fig. 2). Loosen the top quarter material flaps which are cemented to the front and rear side rails (each side).

9. Disengage the top material hold-down cables from the rear side rail attachment and pull the cables forward until each is removed from the retaining sleeve (Fig. 14).

10. Remove each side rail coat hook.

11. Raise the top and clamp the No. 1 bow to the header.

12. Install the two fabricated bow locating gauges as shown in Fig. 15.

13. Remove the No. 2 and No. 3 bow listing retainer screws and remove both retainers from the listings (Fig. 13).

14. Raise the compartment trim up sufficiently to remove all of the tacking strip attaching screws (Fig. 13).

15. Remove the No. 4 bow outside moulding end tips, moulding and moulding retainer (Fig. 13).

16. Detach the top material from the No. 4 bow. Peel the top material back to expose the No. 4 bow and mark the existing top back stay webbing location at the No. 4 bow and the tacking strip (Fig. 14).

17. Detach the upper end of the webbing from the No. 4 bow. Unzip the rear curtain window and remove the soft trim with tacking strips attached. Place the assembly on a bench.

18. Mark the No. 4 bow at both ends of the zipper elastic material and detach the upper half of the zipper assembly from the No. 4 bow.

19. To assure the proper location of the tacking strips in the new top assembly, back curtain window assembly and/or compartment trim assembly, proceed as follows:

a. Locate the center punch mark on the belt center tacking strip retainer (Fig. 13, View A-A). Transpose this center mark to the adjacent

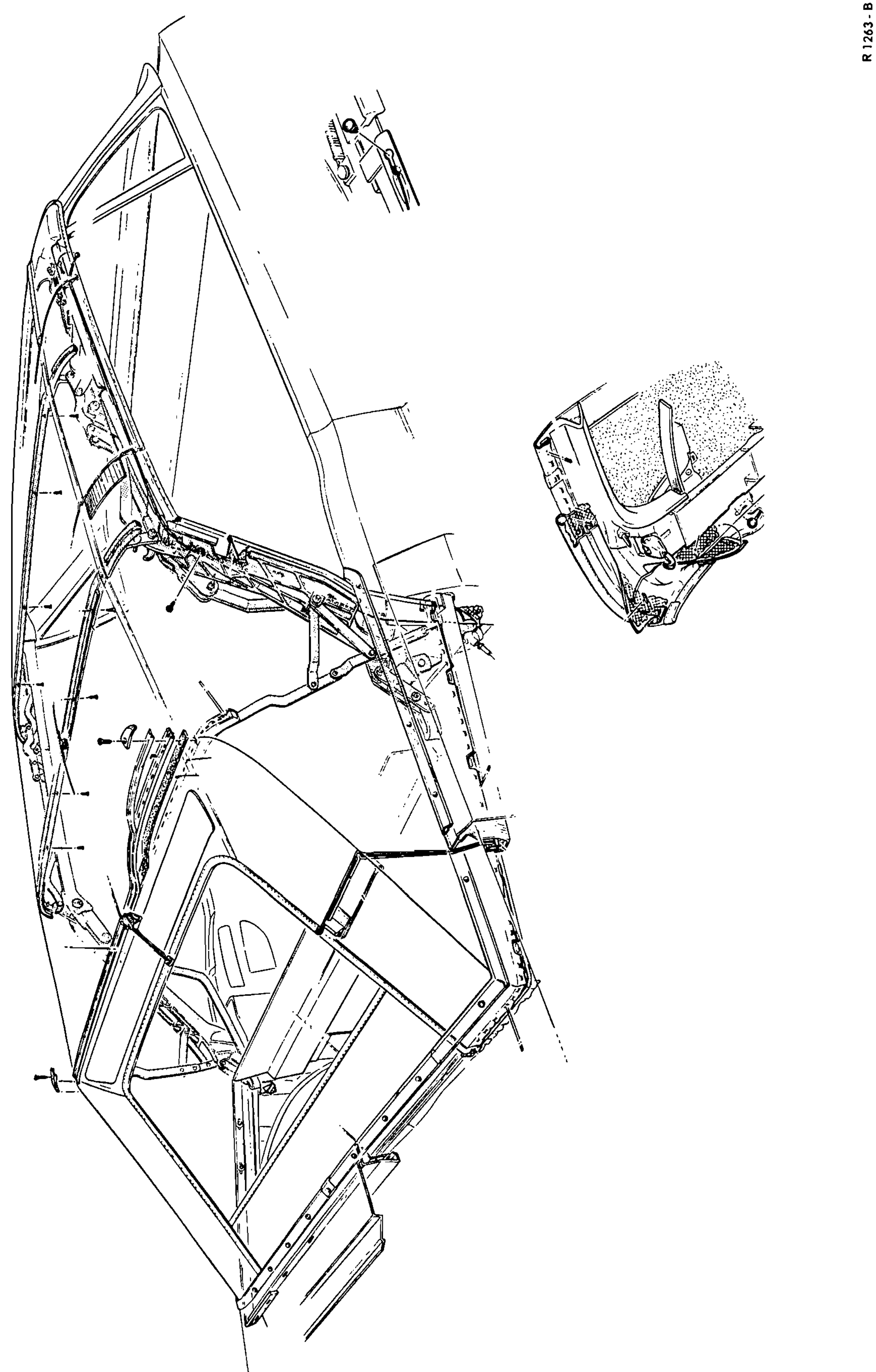


FIG. 11—Convertible Top Trim Installation—Mercury Intermediate, Fairlane

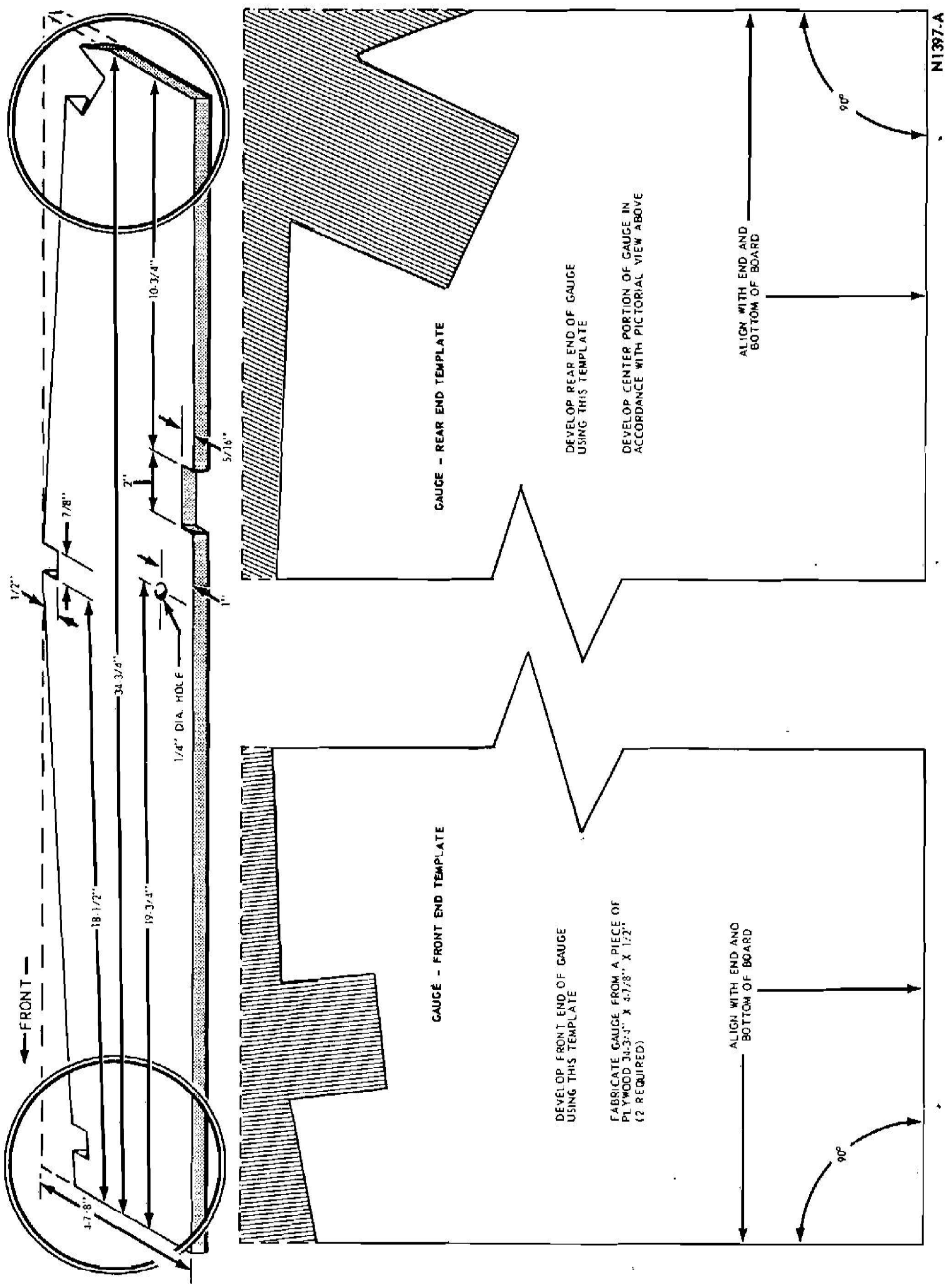


FIG. 12—Bow Locating Gauge Fabrication

rear curtain and compartment trim materials.

b. Mark the rear curtain along the lower edge of the belt center tacking strip (Fig. 13, View BB and CC).

c. Mark the belt center tacking strip to indicate the rear window opening at both sides (Fig. 13, View BB).

d. Mark the top deck quarters along the lower edge and at the ends of each belt side front tacking strip (Fig. 13, View CC).

20. Carefully and without tearing the material, detach the trim material being replaced from the tacking strips.

21. Trim off the selvage edge of the **old top** deck quarter and/or back curtain material that extends below the tacking strips. **The selvage edge must only be cut from the old parts which are being replaced.**

Installation

1. Lay the new rear curtain window assembly on a clean bench with the interior surface up. Measure the width and mark the center of the back window at the top, above the zipper, and at the bottom, at the tacking strip area (Fig. 13).

2. Using the old rear curtain window assembly as a template, mark the new curtain to indicate the lower edge of the tacking strip. Also mark the tacking strip attaching hole locations. Carefully remove the old rear curtain window assembly and cut out the tacking strip attaching holes in the new curtain, only.

3. Using the old top assembly as a template, mark the new top quarter deck to indicate the lower edge of the tacking strip. Also mark the tacking strip attaching hole locations. Discard the old top. Cut out the tacking strip holes in each quarter of the new top, only. **Do not trim off the selvage edge.**

4. Using the old compartment trim as a template, transpose the markings to the new compartment.

5. Align the belt center tacking strip with the compartment trim alignment marks and retain with staples. The edge of the material should be flush with the bottom of the tacking strip.

6. Align the belt center tacking strip with the rear curtain window aligning marks and retain it with staples.

7. Align the belt side front tacking strip with the aligning marks on the top deck quarter (both sides) and retain it with staples.

8. Position each top back stay webbing on the belt center tacking strip and retain it with staples (Fig. 14).

9. Align the top deck quarter to the belt center tacking strip, maintain proper rear curtain opening and retain it with staples (Fig. 13, View BB).

10. Carefully position the upper half of the zipper assembly on the No. 4 bow aligning the bow and material center marks. The edge of the material should be flush with the front edge of the No. 4 bow tacking strip. Working from the center outboard, secure the assembly with staples. Both ends of the elastic strip should correspond with the marks on the No. 4 bow. Refer to Step 19 under Removal.

11. Position the rear curtain and top assembly on the stack and engage the zipper.

12. Position the top back stay webbing on the No. 4 bow aligning marks and secure it with staples (Fig. 14).

13. Install a piece of masking tape on the underside of the No. 4 bow at the centerline punch mark located

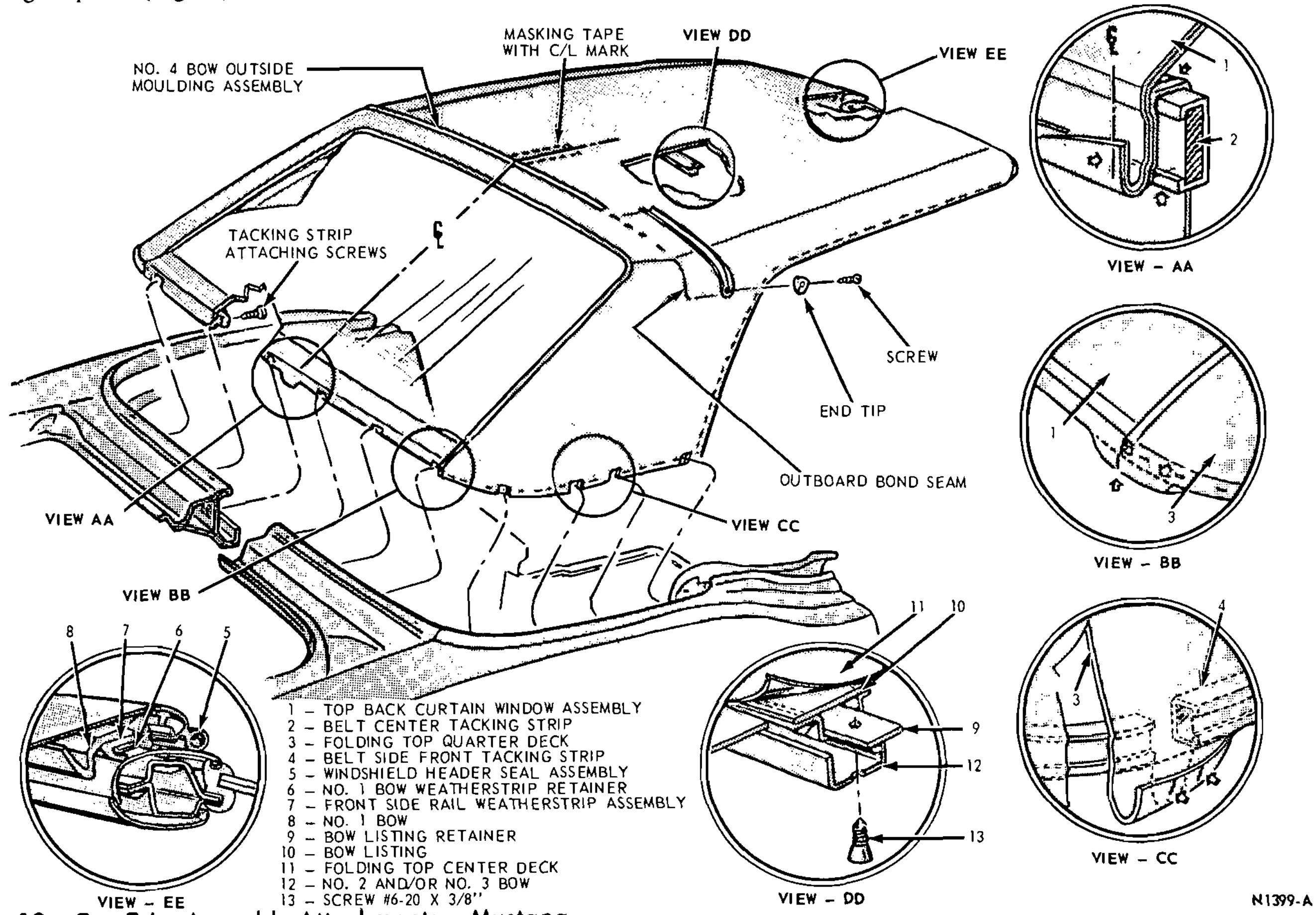


FIG. 13—Top Trim Assembly Attachments—Mustang

in the bow. Mark the tape indicating the centerline.

14. Measure and mark the center between the bond seams of the top center deck at the No. 4 bow on the underside of the material. Install a 6-inch piece of masking tape on the top material inner surface at the centerline of the No. 4 bow. Mark the centerline along the entire length of tape. (Refer to Fig. 13.)

15. With the bow locating gauge in place (refer to Step 13 under Removal and Fig. 15), install the belt center tacking strip attaching screws to approximately 1/4 to 1/2-inch from the bottoming out position. Install the belt side front tacking strip attaching screws and tighten to within 1/4 to 1/2-inch of bottoming.

16. Center the top material on the No. 4 bow and pull it forward sufficiently to center the outboard bond seam on the No. 4 bow (Fig. 13). Secure the top material to the No. 4 bow with staples.

17. Install the two retainers in the No. 2 and No. 3 bow listings (Fig. 13).

18. Route the quarter deck retaining cables through the hold down sleeves in the top material and retain each cable at the rear (loosely) with the attaching nut and washer (Fig. 14).

19. Pull the top trim material forward over the No. 1 bow until the No. 2 and No. 3 bow listings (Fig. 13) are centered over their respective bows. While maintaining tension on the top trim, place a pencil mark on the outer surface of the trim material along the forward edge of the No. 1 bow.

20. Remove the two bow aligning gauges and reinstall the coat hooks (Fig. 4).

21. Fold the front edge of the top material back from the No. 1 bow. Disengage the No. 1 bow from the windshield header and prop it up about one foot above the header.

22. Apply an ample amount of trim cement C2AZ-19C525-A across the lower front surface of the No. 1 bow including the tacking strip and to the adjacent inner surface of the top material.

23. Lower the No. 1 bow onto the header but do not clamp it. With the top material properly centered on the No. 1 bow, start at the outer front corners and alternately pull the material forward to the pencil aligning mark. Make certain that all wrinkles are removed, and then fold and cement the material to the underside of the bow.

24. Position the windshield header seal assembly (Fig. 13) and secure the seal and top material with staples. Trim off excess top material.

25. Cement the front and rear flaps to each side rail. Pierce holes in the flaps for the weatherstrip attachments.

26. Install the front side rail weatherstrip and the No. 1 bow retainer.

27. Tighten the retainer cable adjustment nut at each rear side rail sufficiently to hold the top material tightly against the rail.

28. Install the intermediate and rear side rail weatherstrips. Adjust as required (Fig. 2).

29. With the No. 1 bow clamped to the header, tighten all belt tacking strip attaching screws securely.

30. Install the compartment trim to the belt side front tacking strip with the attaching screws (Fig. 10).

31. Install the compartment trim with the seat back support lower ledge attaching screws (Fig. 10).

32. Install the rear seat back and cushion.

33. Remove the interior centerline tape strips.

34. Install the No. 4 bow outside moulding retainer, insert the moulding and install the two end tips (Fig. 13).

ROOF FRONT HEADER WEATHERSTRIP

MERCURY INTERMEDIATE, FAIRLANE

1. Release the toggle clamps and lower the top.
2. Remove the screws attaching the weatherstrip retainer to the No. 1 bow and remove the retainer (Fig. 17).
3. Remove the adjusting screws at the outboard ends of the No. 1 bow.

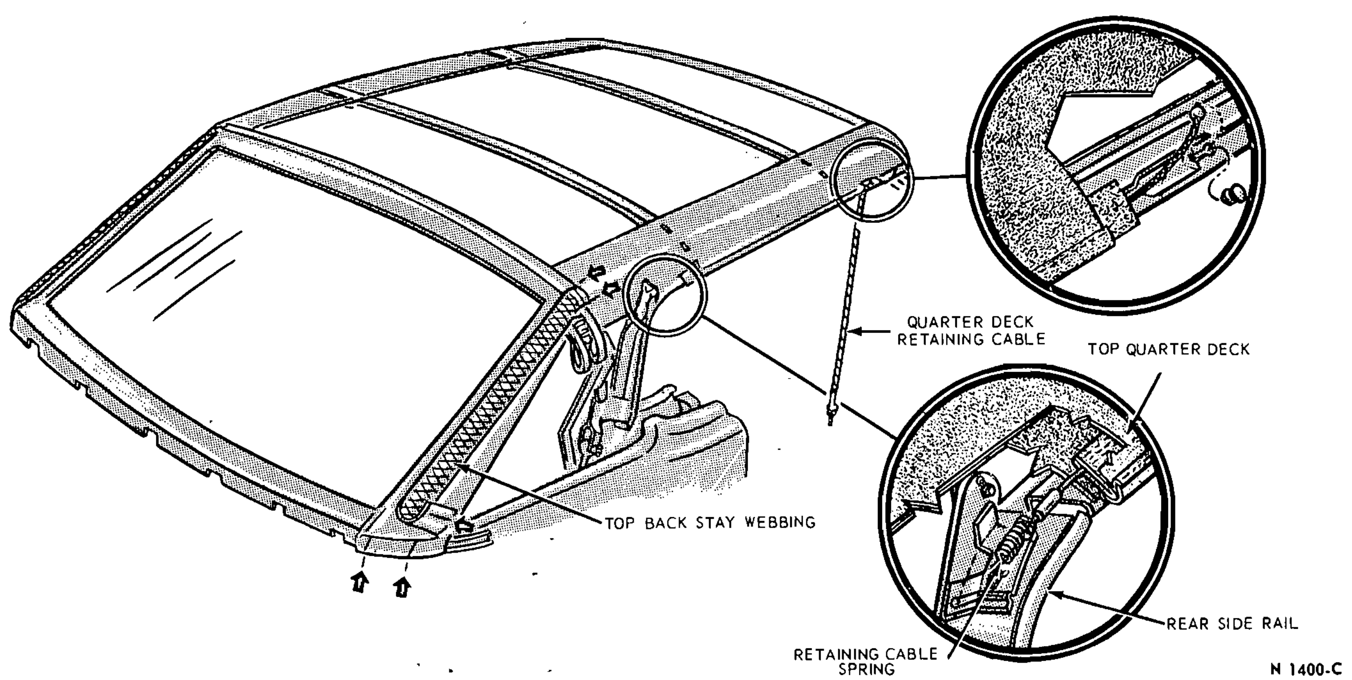


FIG. 14—Top Stay Pad Webbing and Quarter Deck Retainer Cable Attachments—Mustang

4. Remove the nuts retaining the weatherstrip to the right and left front side rails and remove the weatherstrip assembly.
5. Position the weatherstrip assembly to the No. 1 bow and install the retainer and retaining screws.
6. Install the adjusting screws at the outboard ends of the No. 1 bow.
7. Position the side rail sections of the weatherstrip and install the retaining nuts.
8. Adjust the weatherstrip for a good seal and tighten the retaining screws and nuts.
9. Raise the top and lock it to the windshield header.

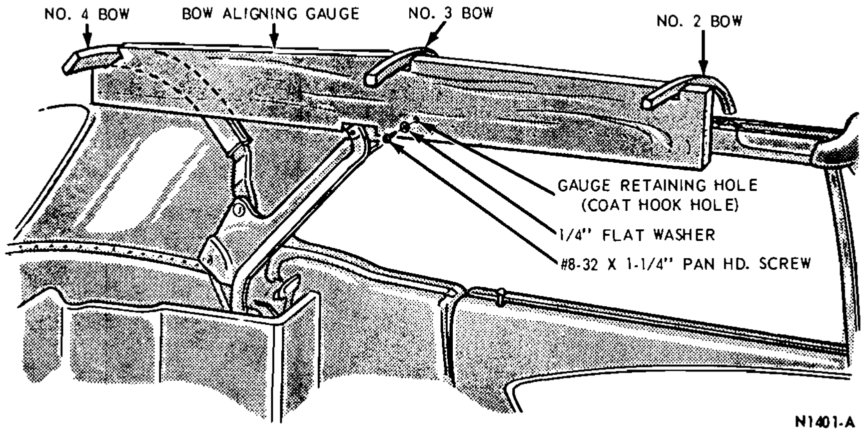


FIG. 15—Bow Locating Gauge Installation—Mustang

MUSTANG

1. Release the toggle clamps and partially lower the top.
2. Remove 12 screws attaching the weatherstrip retainer to the header and remove the retainer.
3. Remove 2 screws attaching the weatherstrip to the header at each corner (Fig. 16).
4. Remove 6 nuts and washers (3 each side) retaining the weatherstrip to the roof side rails and remove the weatherstrip.
5. Apply sealer to the header and roof side rails and place the new weatherstrip in position.
6. Install the weatherstrip retainer with 12 screws and the 2 weatherstrip attaching screws at each corner.
7. Install 3 nuts and washers attaching the weatherstrip to each side rail. Trim the weatherstrip for a watertight fit (Fig. 16).
8. Raise the top and lock it to the windshield header.

SIDE RAIL WEATHERSTRIP — CENTER AND/OR REAR — MERCURY INTERMEDIATE, FAIRLANE

REMOVAL

1. Lower the top as far as required to carry-out the operation.
2. If removing the center weatherstrip, remove the three retaining tee nuts and separate the retainer from the side rail. This is not necessary on the rear side rail (Fig. 17).

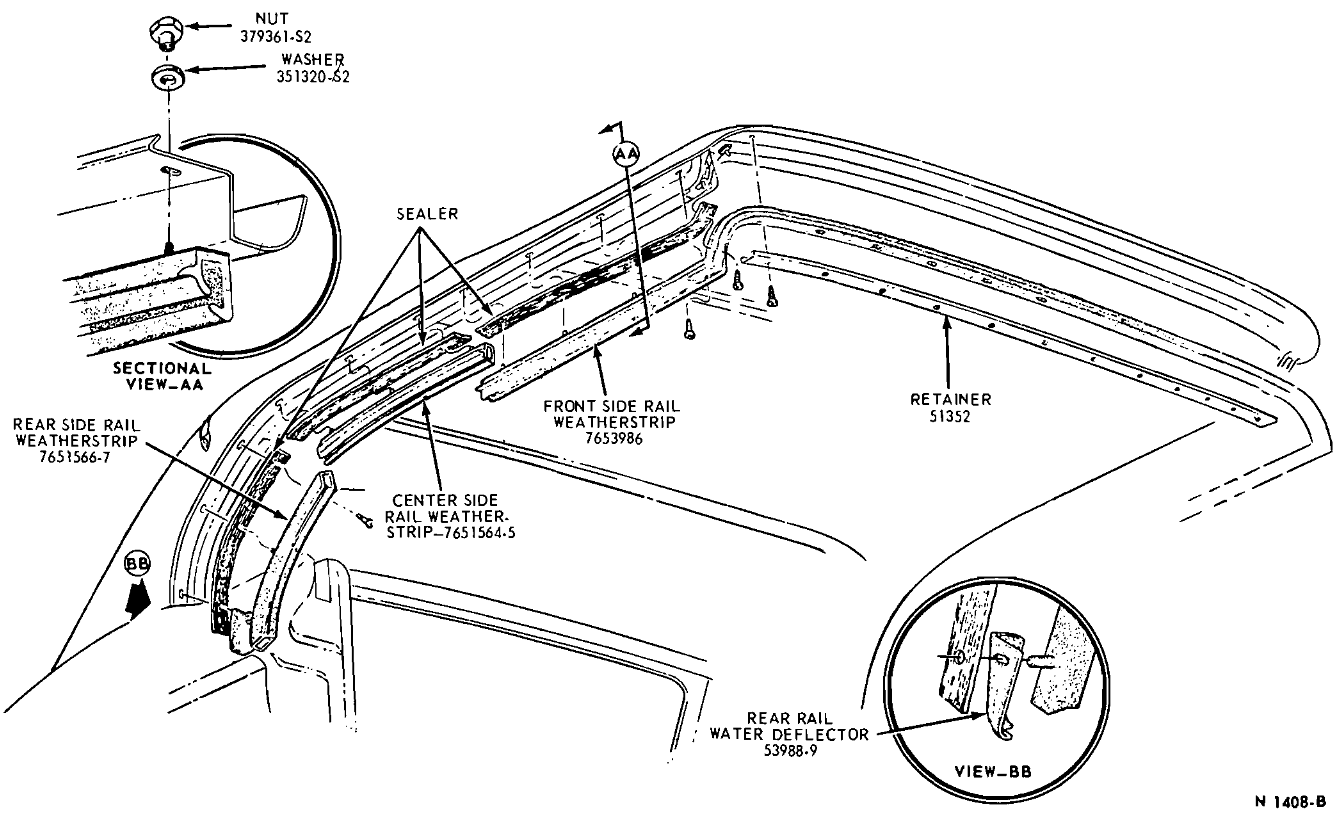


FIG. 16—Side Rail Weatherstrip—Mustang

3. To remove the weatherstrip from rear side rail slide the weatherstrip out of the retainer. For the center side rail, remove the weatherstrip from the retainer removed in step two.

INSTALLATION

1. Install the weatherstrip in the rear side rail by sliding the weatherstrip into the retainer.

2. To install the center side rail weatherstrip, position the weatherstrip in the retainer and position the retainer to the side rail and install the three retaining nuts (Fig. 17).

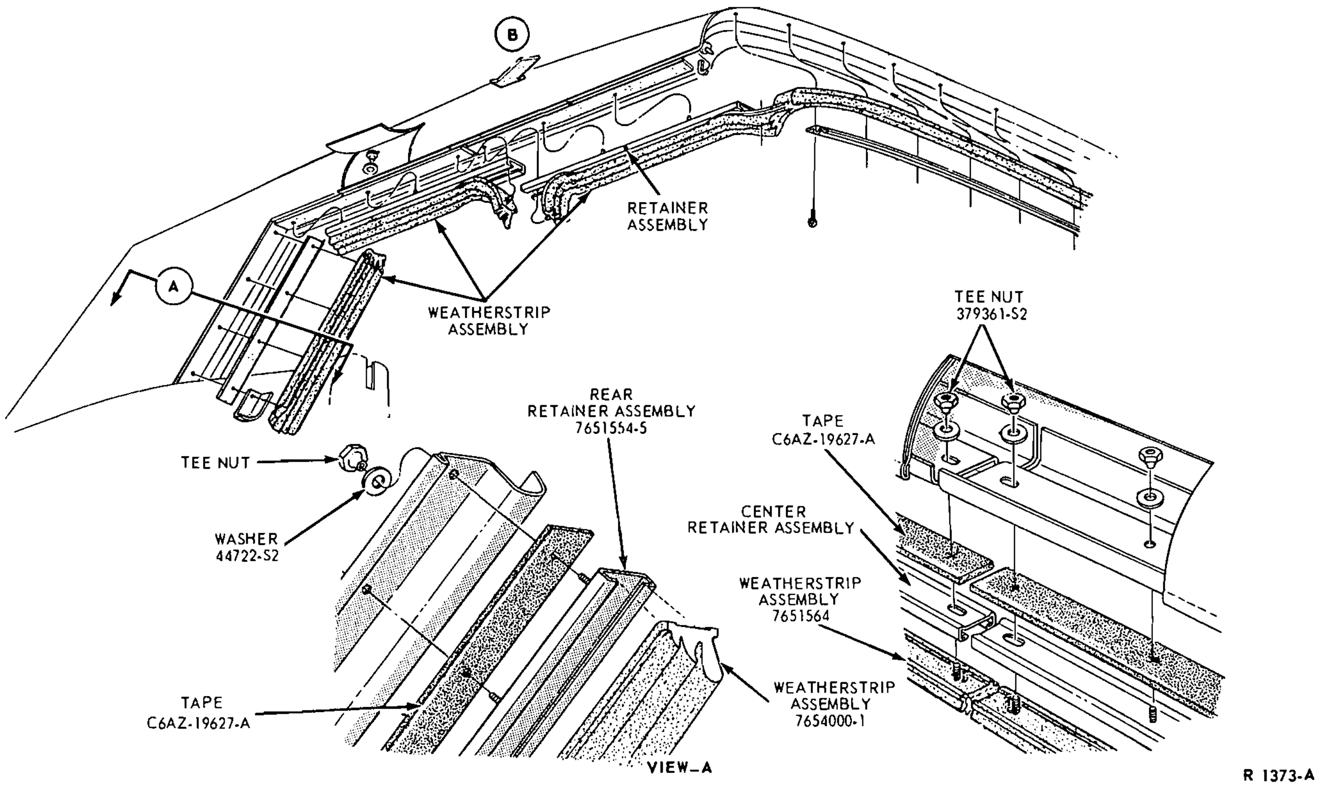


FIG. 17—Folding Top Weatherstrip — Fairlane, Mercury Intermediate

Trouble Symptoms

Possible Causes of Trouble Symptoms	Top Does Not Retract	Top Action Sluggish	Top Sides Operate Unevenly	Top Does Not Stack	Side Rail(s) Do Not Fit	Top Does Not Rise From Stack	Top Does Not Latch	Top Leaks
Top Control Switch	X					X		
Inadequate Battery Charge	X	X				X		
Motor and Pump	X	X				X		
Circuit Breaker	X					X		
Faulty Wiring	X	X				X		
Hydraulic Cylinder(s)	X	X	X			X		
Air in Hydraulic System	X	X				X		
Insufficient Hydraulic Fluid	X	X				X		
Top Lowered when Wet Causing Fabrie to Shrink							X	
Toggle Clamp Adjustment ①							X	X
Door Window Adjustment ①					X			X
Quarter Window Adjustment ①					X			X
Weatherstripping								X
Balance Link Bracket Adjustment				X	X			
Center Side Rail Adjustment (Mustang only)					X			

① The top should not be raised with the windows up.

FIG. 18—Trouble Symptoms and Possible Causes

Schematics

GROUP 19

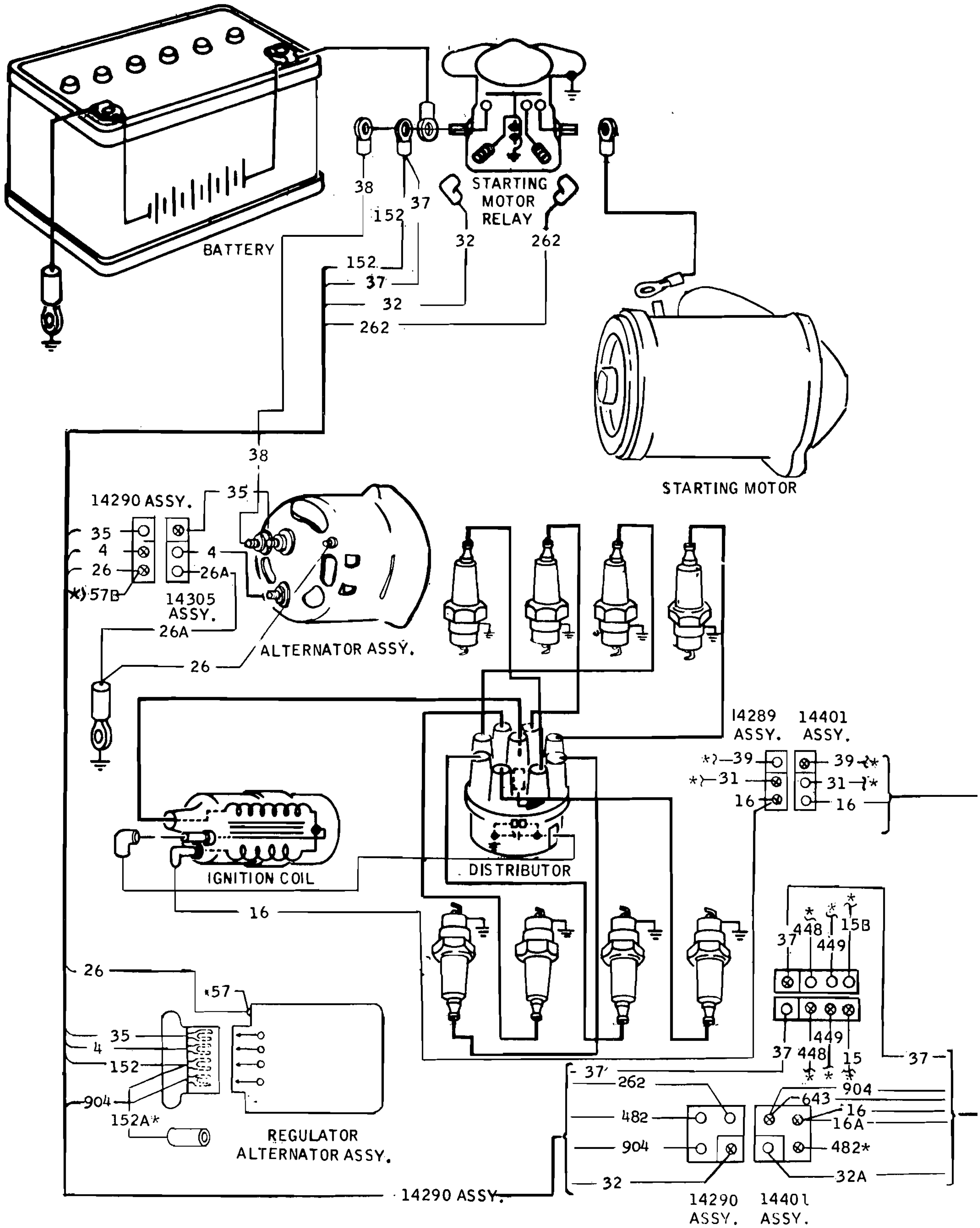
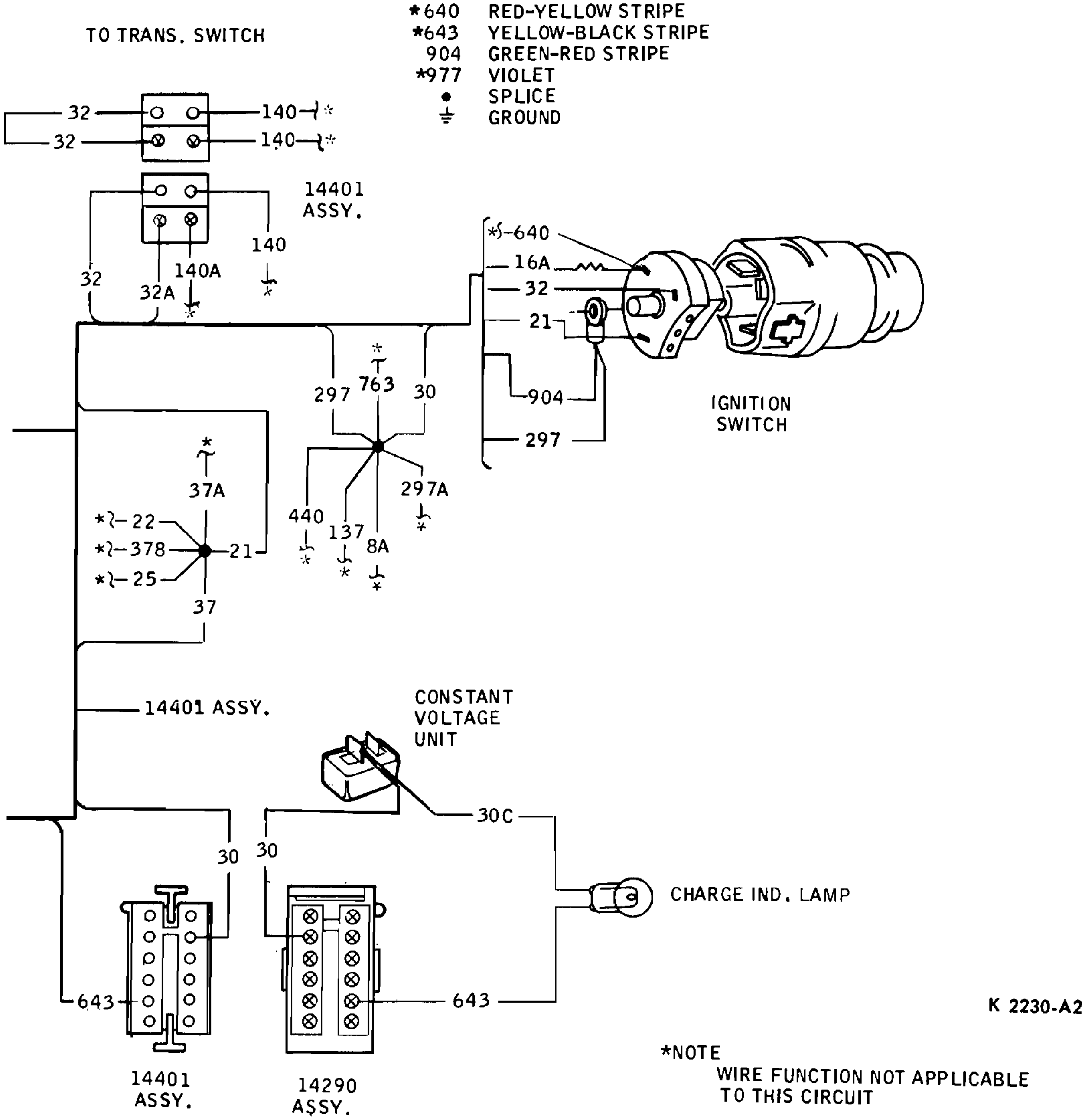


FIG. 1—Cougar Ignition, Starting and Charging

K 2230-A1

WIRING COLOR CODE

4	WHITE-BLACK STRIPE
15B 15	RED-YELLOW STRIPE
16A 16	RED-GREEN STRIPE
21	YELLOW
26A 26	BLACK-RED STRIPE
32A 32	RED-BLUE STRIPE
35	WHITE
37	BLACK-YELLOW STRIPE
39	RED-WHITE STRIPE
38 57B 57	BLACK
140A 140	BLACK-RED STRIPE
152	YELLOW
262	BROWN
*297	BLACK-GREEN STRIPE
482	BLUE-YELLOW STRIPE
*640	RED-YELLOW STRIPE
*643	YELLOW-BLACK STRIPE
904	GREEN-RED STRIPE
*977	VIOLET
•	SPLICE
⏚	GROUND



*NOTE
WIRE FUNCTION NOT APPLICABLE
TO THIS CIRCUIT

FIG. 1—Cougar Ignition, Starting and Charging (Continued)

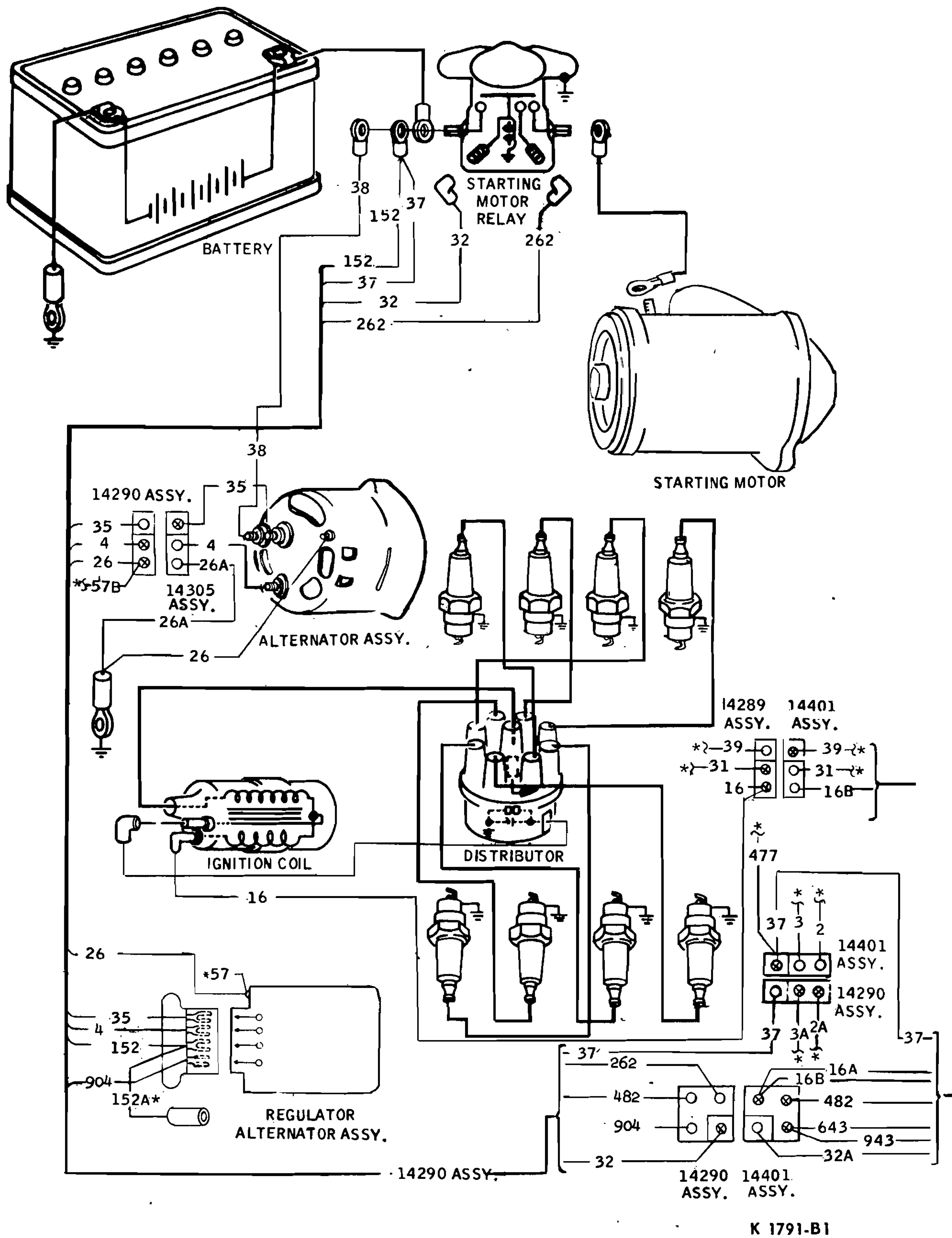
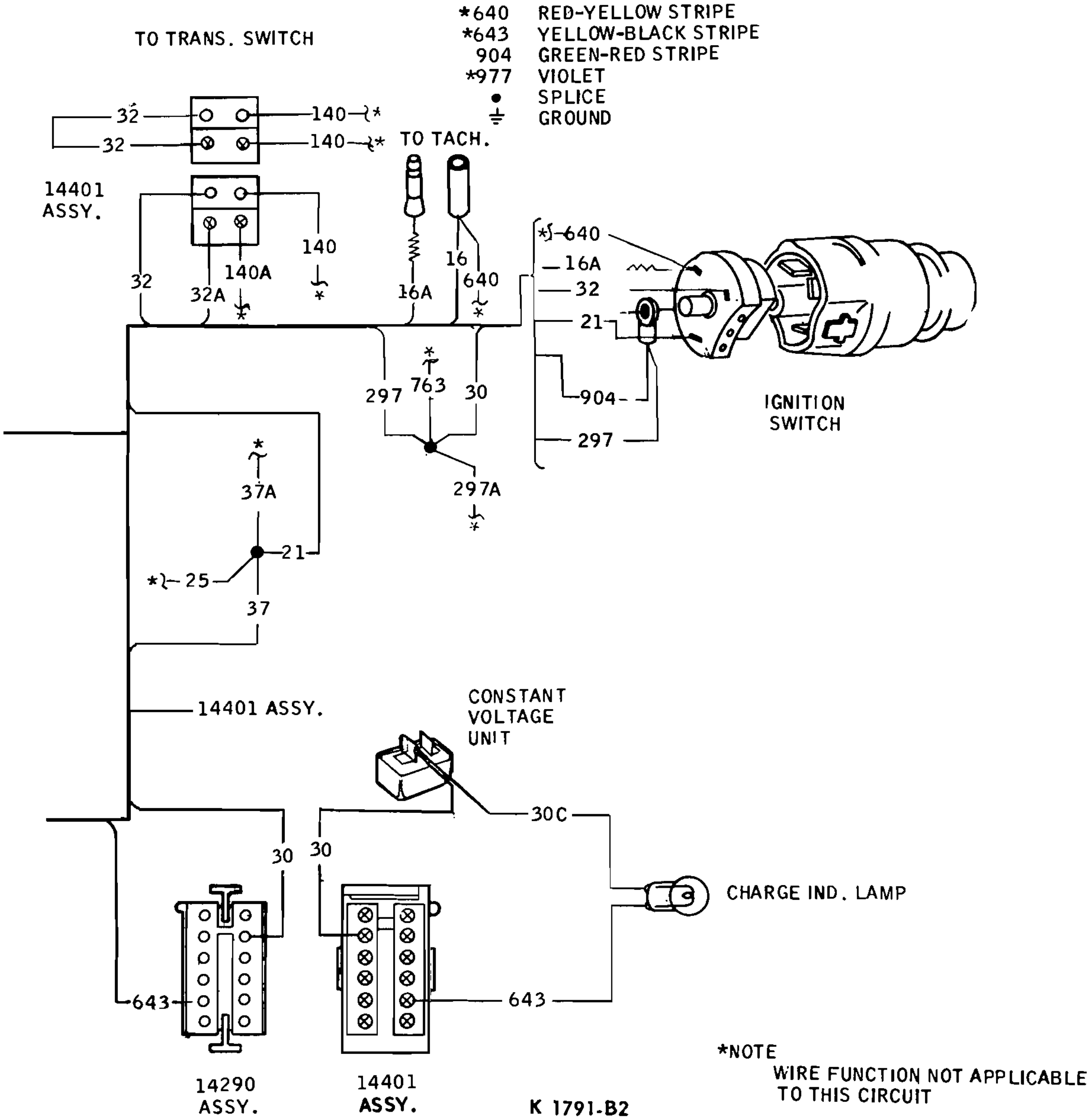


FIG. 2—Mustang Ignition, Starting and Charging

W I R I N G   C O L O R   C O D E

4	WHITE-BLACK STRIPE
15B 15	RED-YELLOW STRIPE
16A 16	RED-GREEN STRIPE
21	YELLOW
26A 26	BLACK-RED STRIPE
32A 32	RED-BLUE STRIPE
35	WHITE
37	BLACK-YELLOW STRIPE
39	RED-WHITE STRIPE
38 57B 57	BLACK
140A 140	BLACK-RED STRIPE
152	YELLOW
262	BROWN
*297	BLACK-GREEN STRIPE
482	BLUE-YELLOW STRIPE
*640	RED-YELLOW STRIPE
*643	YELLOW-BLACK STRIPE
904	GREEN-RED STRIPE
*977	VIOLET
•	SPLICE
⏚	GROUND



K 1791-B2

*NOTE
WIRE FUNCTION NOT APPLICABLE
TO THIS CIRCUIT

FIG. 2—Mustang Ignition, Starting and Charging (Continued)

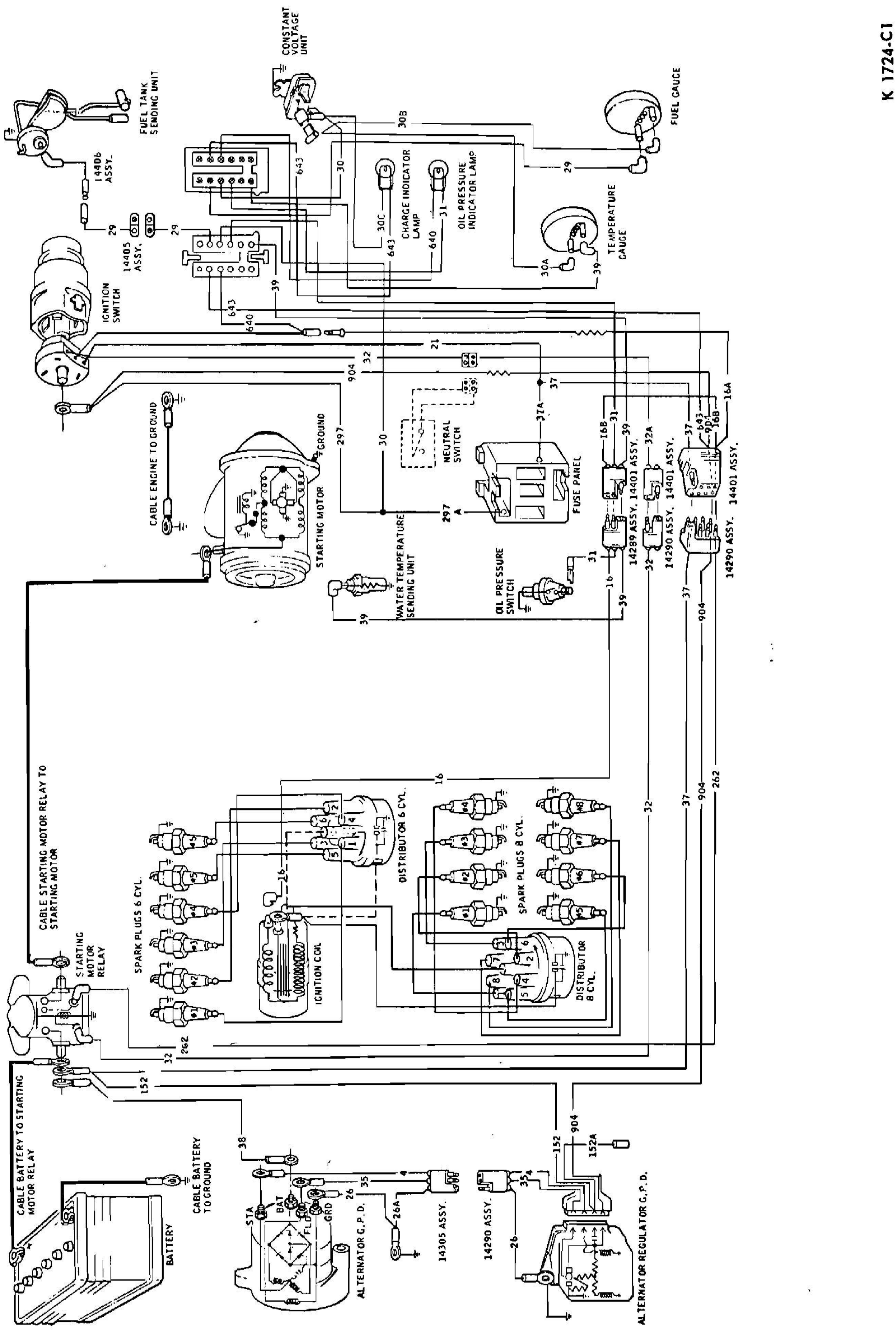
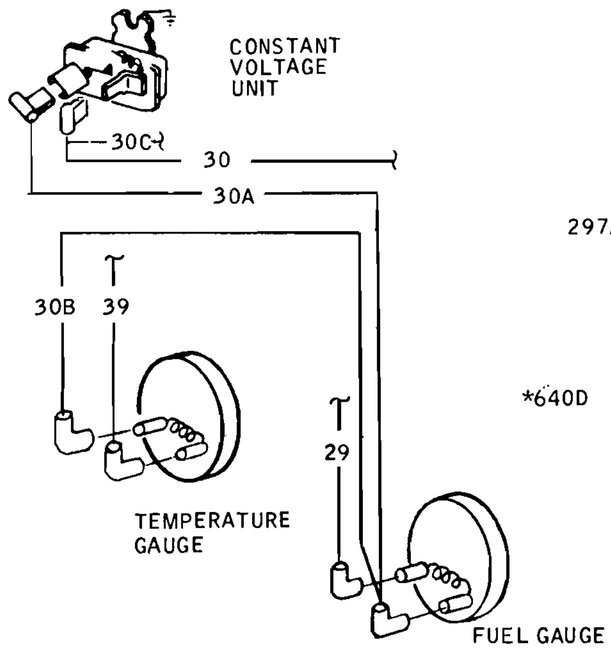


FIG. 3—Falcon, Fairlane, Mercury Intermediate Ignition, Starting, Charging and Gauges



FALCON GAUGE CIRCUIT ONLY

WIRING COLOR CODE

	4	WHITE-BLACK STRIPE
16B	16	RED-GREEN STRIPE
	16A	PINK -(RESISTANCE WIRE)
152A 152	21	YELLOW
*641 26A	26	BLACK-RED STRIPE
	29	YELLOW-WHITE STRIPE
297A 297 30C THRU	30	BLACK-GREEN STRIPE
	31	WHITE-RED STRIPE
32A	32	RED-BLUE STRIPE
	35	WHITE
57A 57	38	BLACK
	39	RED-WHITE STRIPE
	262	BROWN
*640D *640C 640B THRU	640	RED-YELLOW STRIPE
	642	WHITE-GREEN STRIPE
37A 37	643	YELLOW-BLACK STRIPE
	904	GREEN-RED STRIPE
	977	VIOLET
	●	SPLICE
	⏚	GROUND

*FAIRLANE ONLY

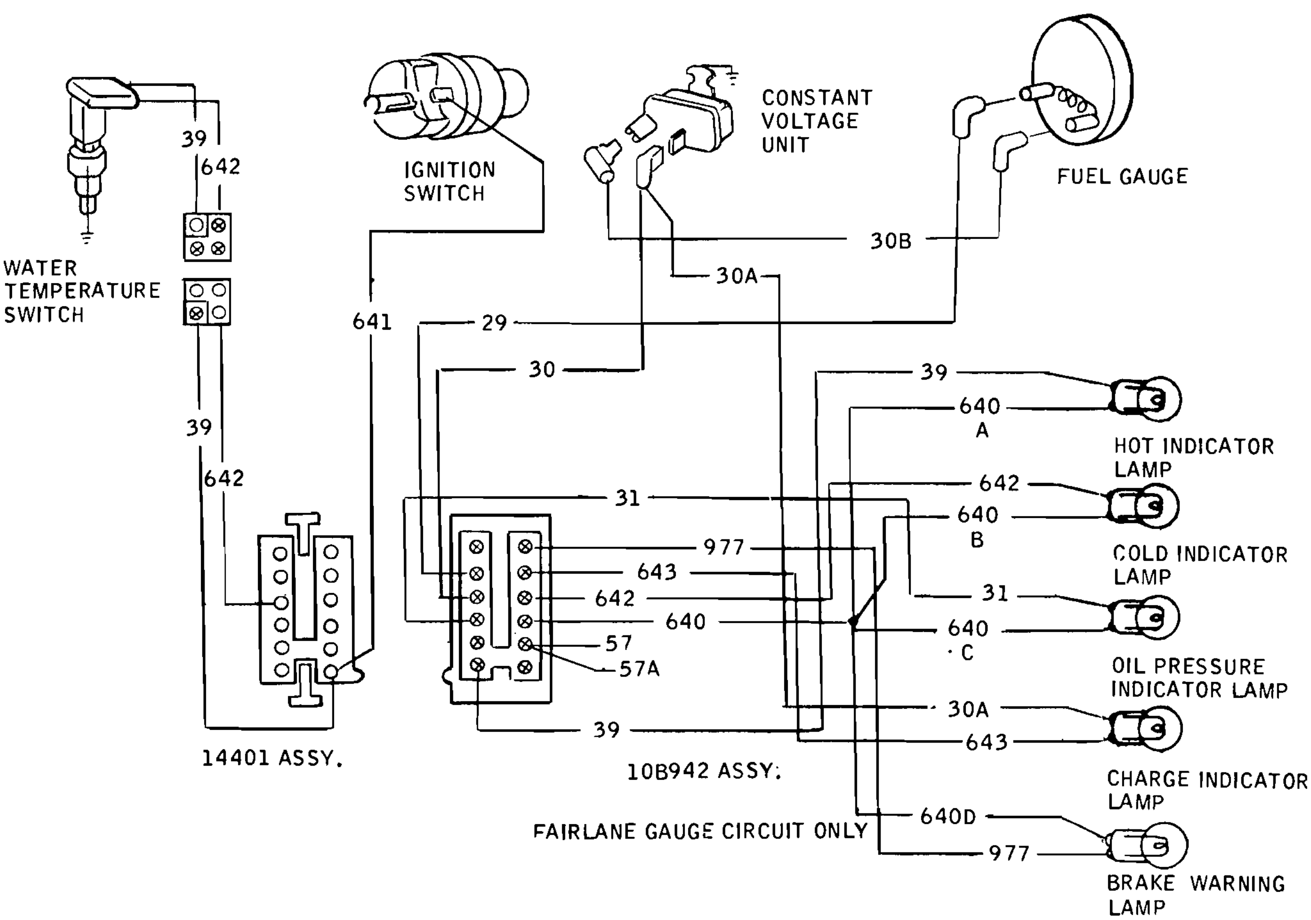


FIG. 3—Falcon, Fairlane, Mercury Intermediate Ignition, Starting, Charging and Gauges (Continued) K 1724-C2

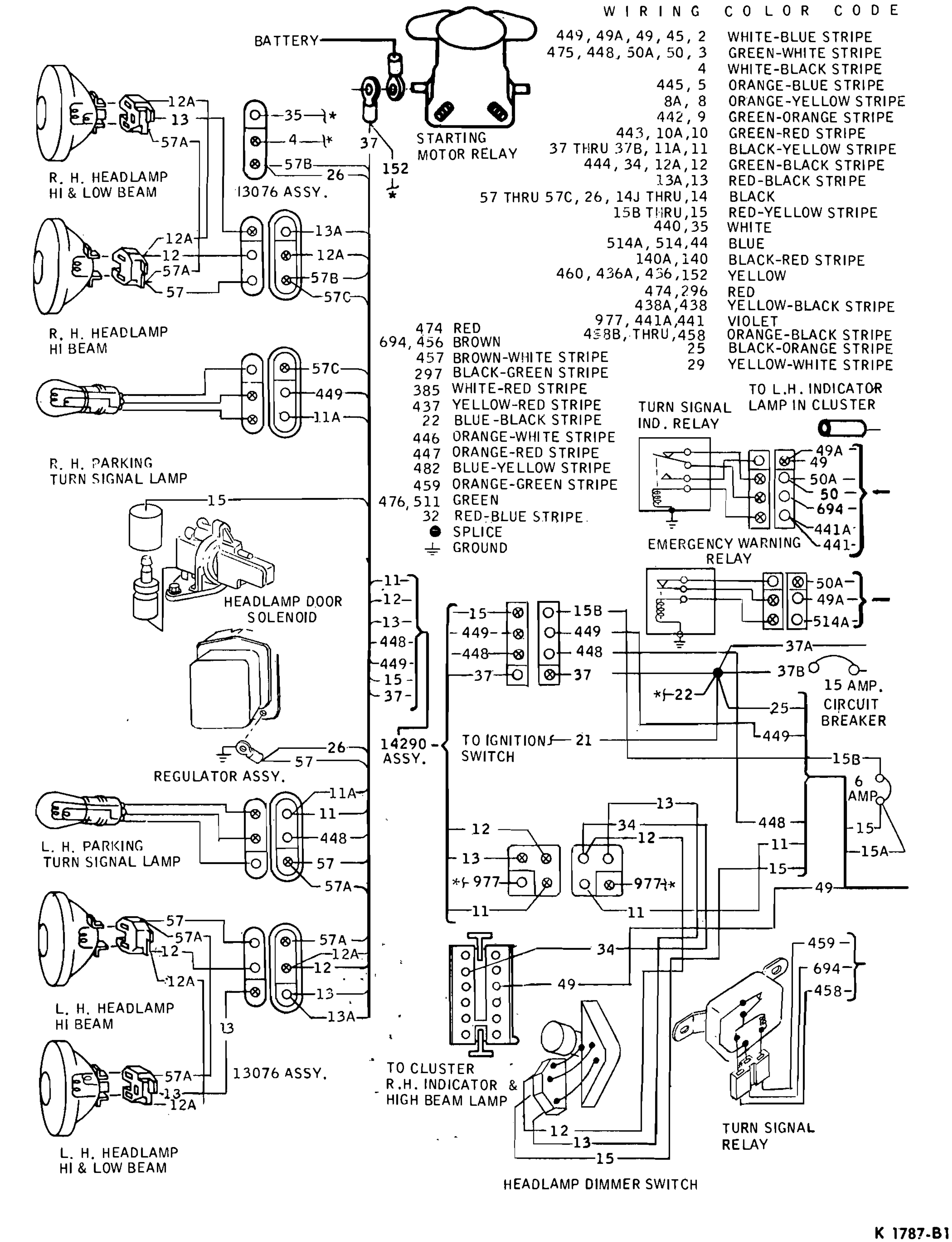


FIG. 4—Cougar Exterior Lighting, Turn Signals and Horns

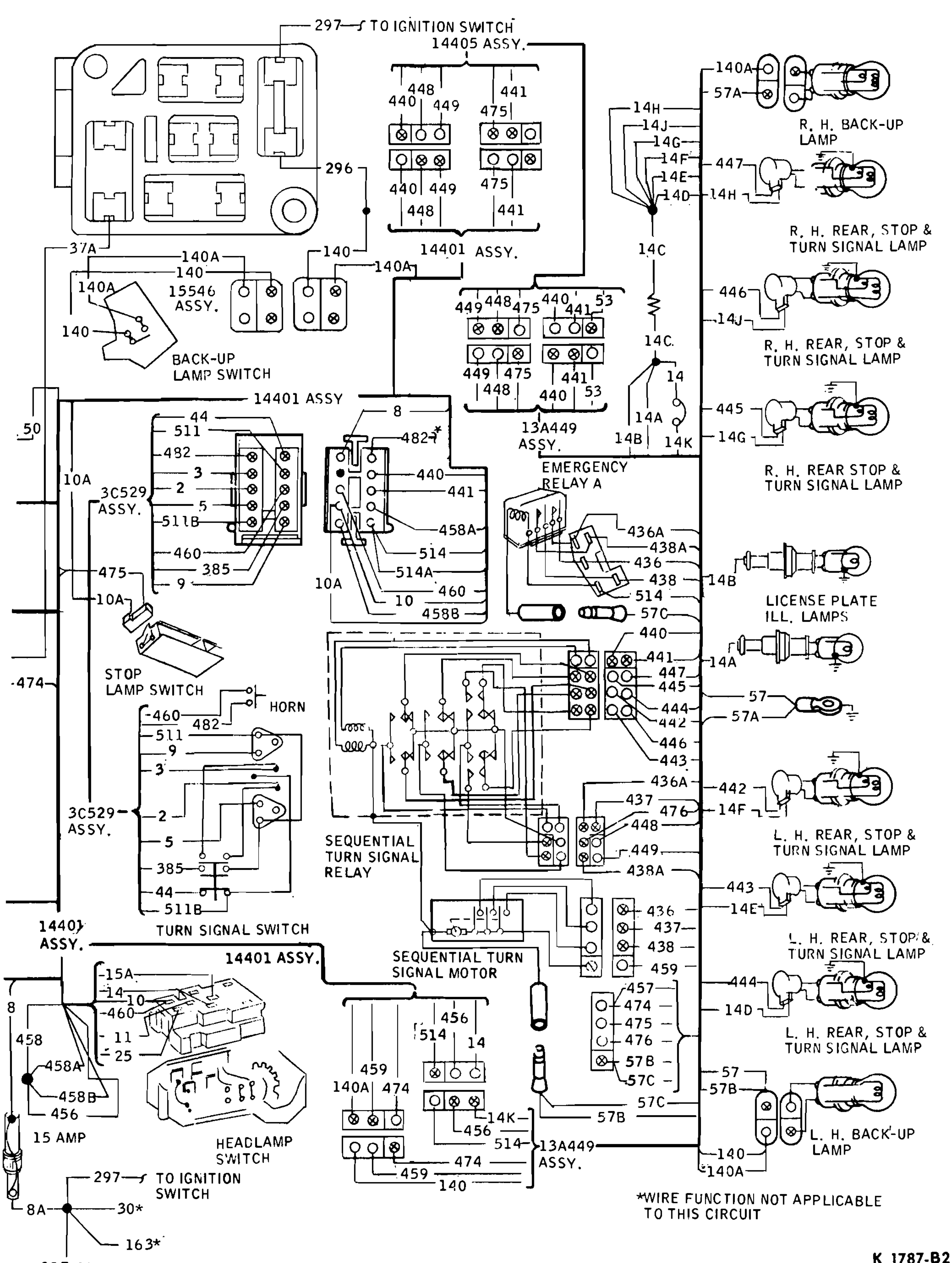


FIG. 4— Cougar Exterior Lighting, Turn Signals and Horns (Continued)

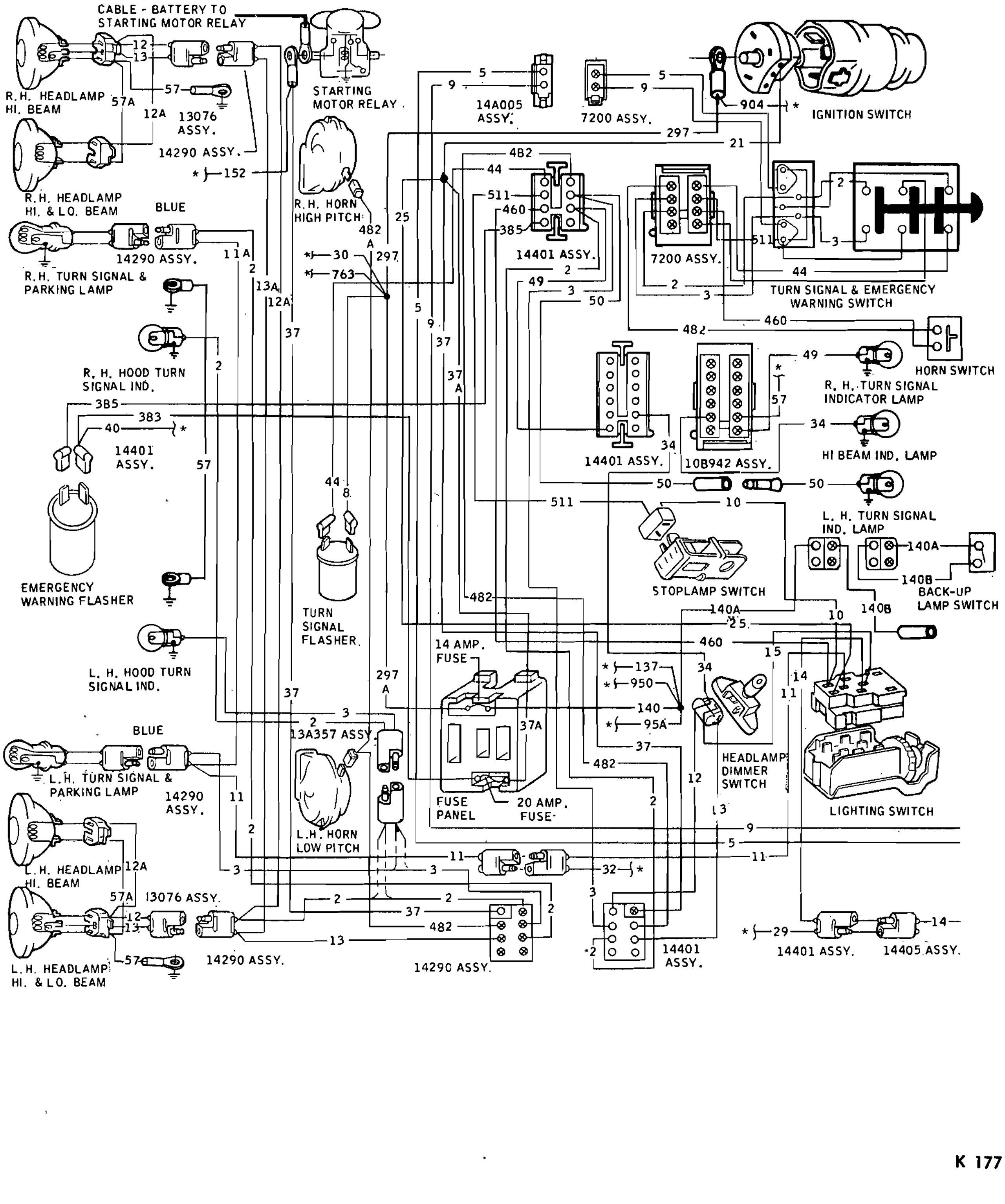
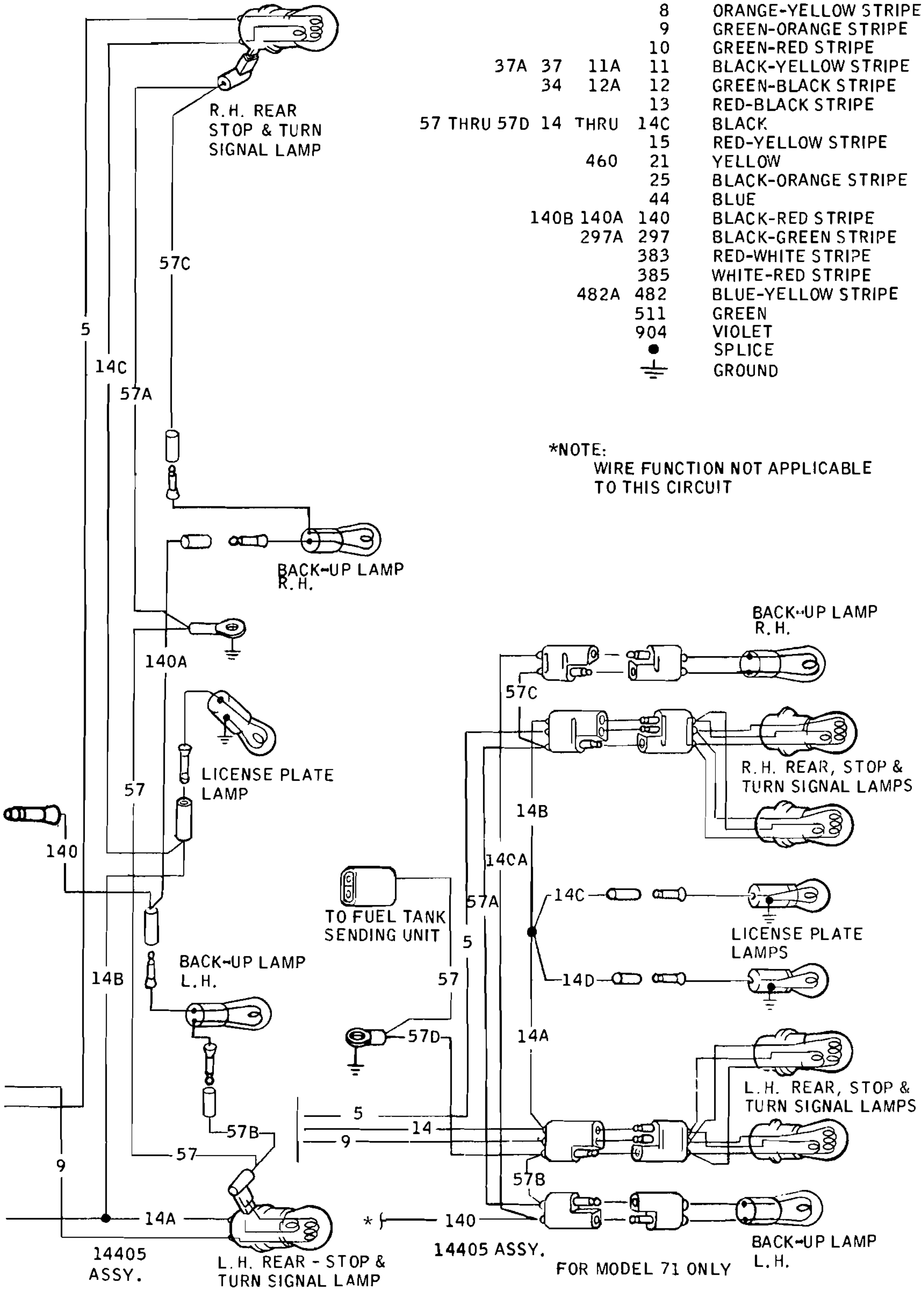


FIG. 5—Fairlane Exterior Lighting, Turn Signals and Horns

WIRING COLOR CODE

49 2	WHITE-BLUE STRIPE
50 3	GREEN-WHITE STRIPE
5	ORANGE-BLUE STRIPE
8	ORANGE-YELLOW STRIPE
9	GREEN-ORANGE STRIPE
10	GREEN-RED STRIPE
37A 37 11A 11	BLACK-YELLOW STRIPE
34 12A 12	GREEN-BLACK STRIPE
13	RED-BLACK STRIPE
57 THRU 57D 14 THRU 14C	BLACK
15	RED-YELLOW STRIPE
460 21	YELLOW
25	BLACK-ORANGE STRIPE
44	BLUE
140B 140A 140	BLACK-RED STRIPE
297A 297	BLACK-GREEN STRIPE
383	RED-WHITE STRIPE
385	WHITE-RED STRIPE
482A 482	BLUE-YELLOW STRIPE
511	GREEN
904	VIOLET
●	SPLICE
⏚	GROUND

*NOTE:
WIRE FUNCTION NOT APPLICABLE
TO THIS CIRCUIT



*NOTE:
WIRE FUNCTION NOT APPLICABLE
TO THIS CIRCUIT

K 1771-B2

FIG. 5—Fairlane Exterior Lighting, Turn Signals and Horns (Continued)

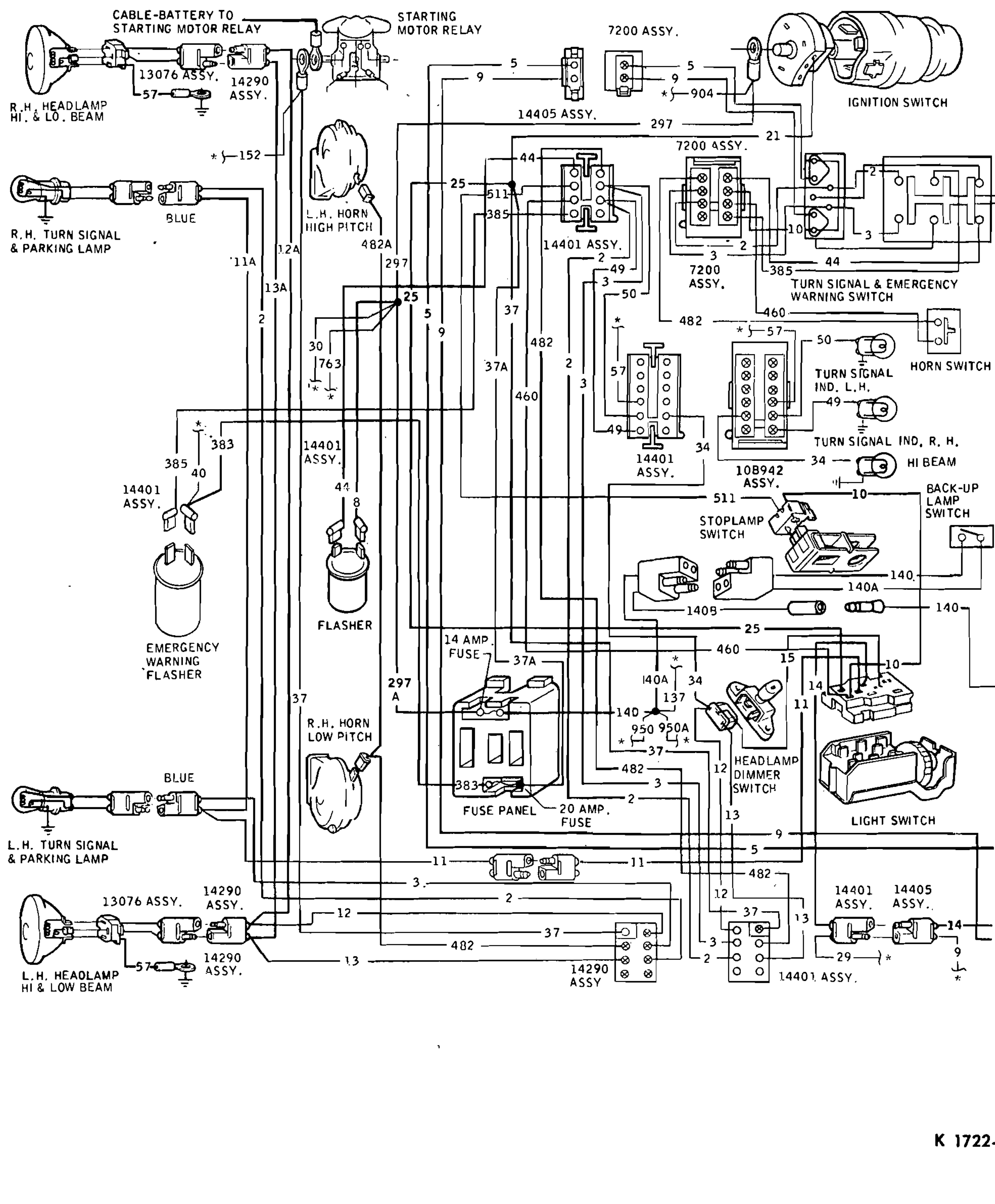
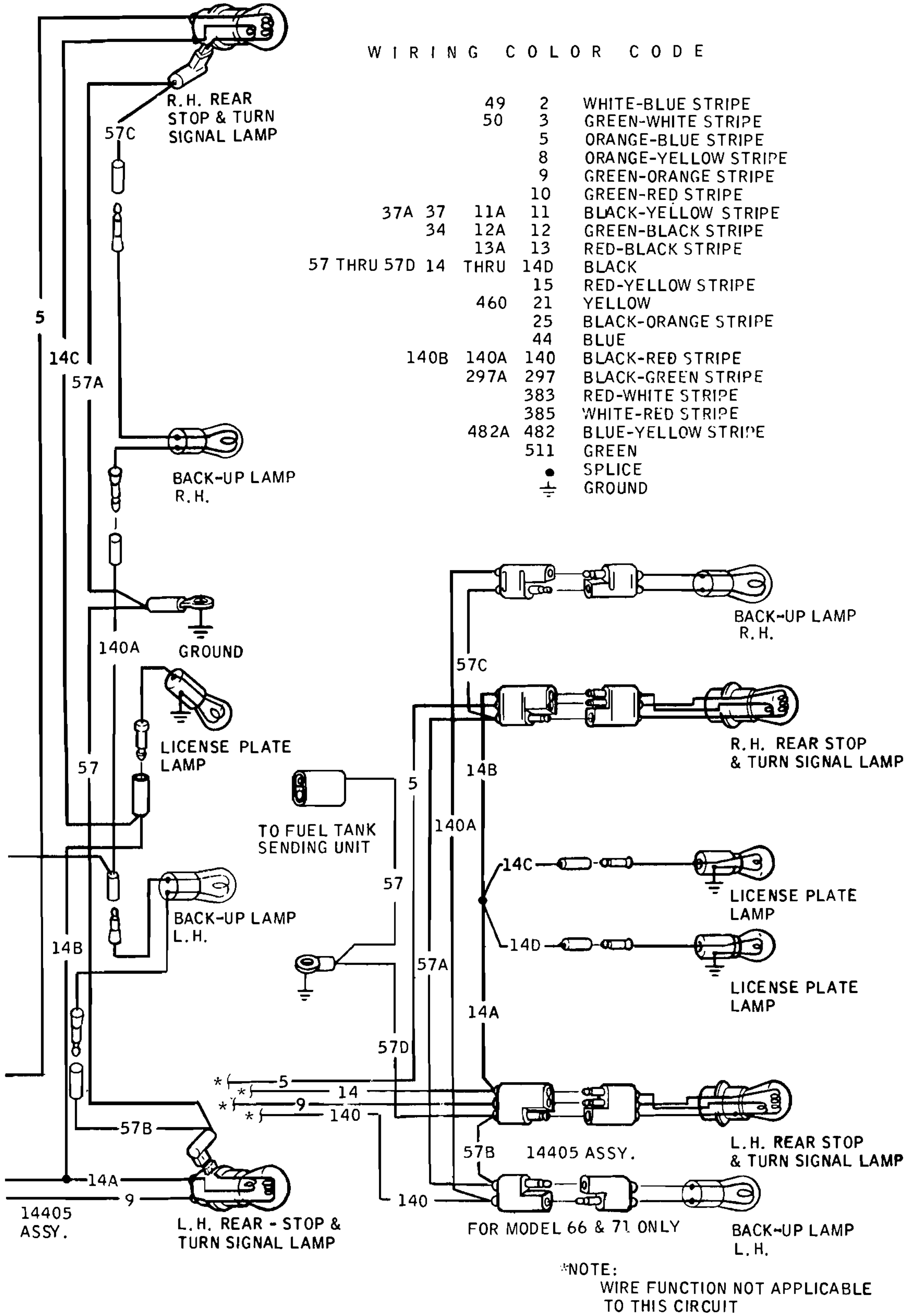


FIG. 6—Falcon Exterior Lighting, Turn Signals and Horns

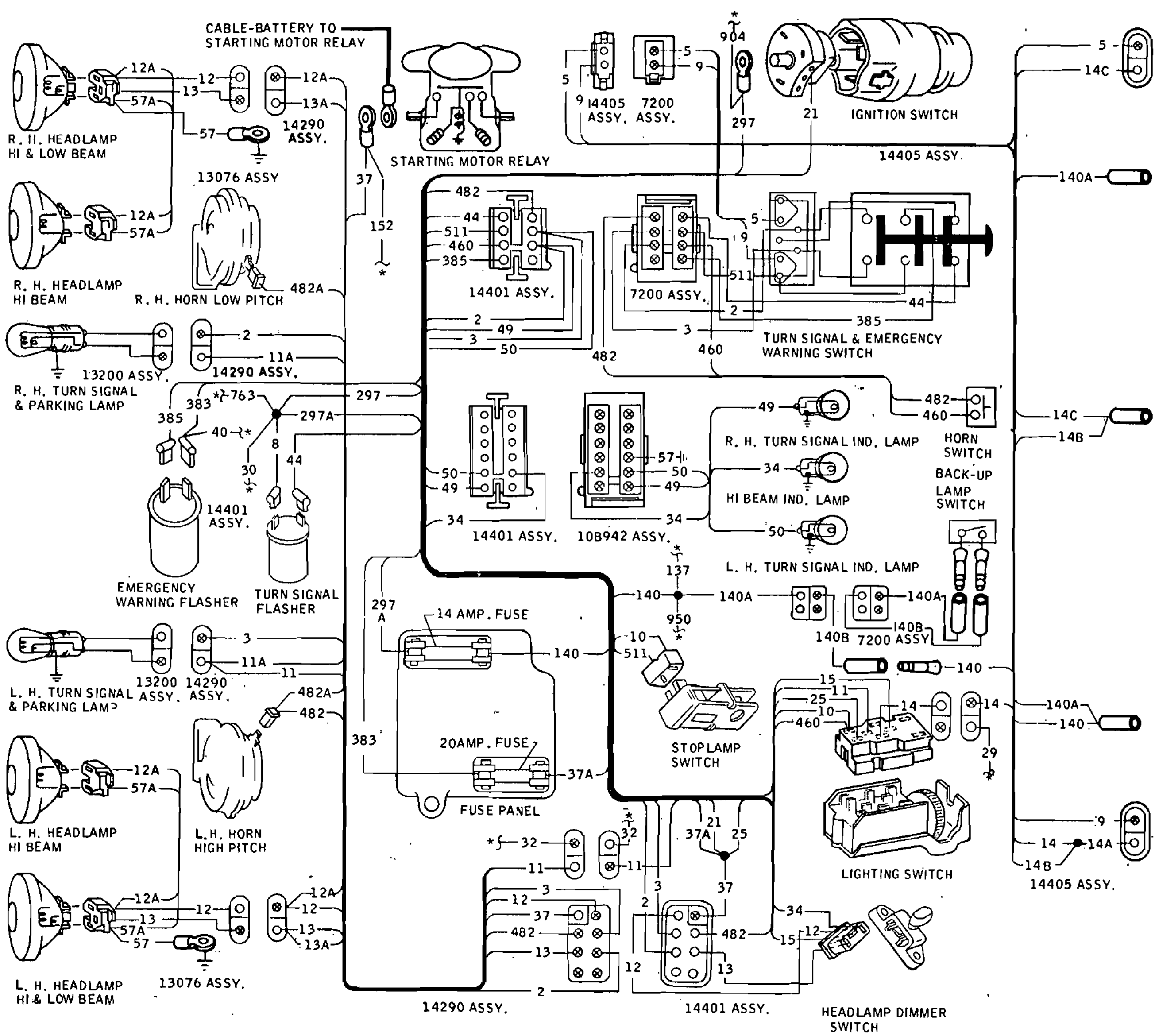


WIRING COLOR CODE

		49	2	WHITE-BLUE STRIPE
		50	3	GREEN-WHITE STRIPE
			5	ORANGE-BLUE STRIPE
			8	ORANGE-YELLOW STRIPE
			9	GREEN-ORANGE STRIPE
			10	GREEN-RED STRIPE
37A	37	11A	11	BLACK-YELLOW STRIPE
	34	12A	12	GREEN-BLACK STRIPE
		13A	13	RED-BLACK STRIPE
57 THRU 57D	14	THRU	14D	BLACK
			15	RED-YELLOW STRIPE
		460	21	YELLOW
			25	BLACK-ORANGE STRIPE
			44	BLUE
	140B	140A	140	BLACK-RED STRIPE
		297A	297	BLACK-GREEN STRIPE
			383	RED-WHITE STRIPE
			385	WHITE-RED STRIPE
		482A	482	BLUE-YELLOW STRIPE
			511	GREEN
			•	SPLICE
			⏚	GROUND

K 1722-C2

FIG. 6—Falcon Exterior Lighting, Turn Signals and Horns (Continued)

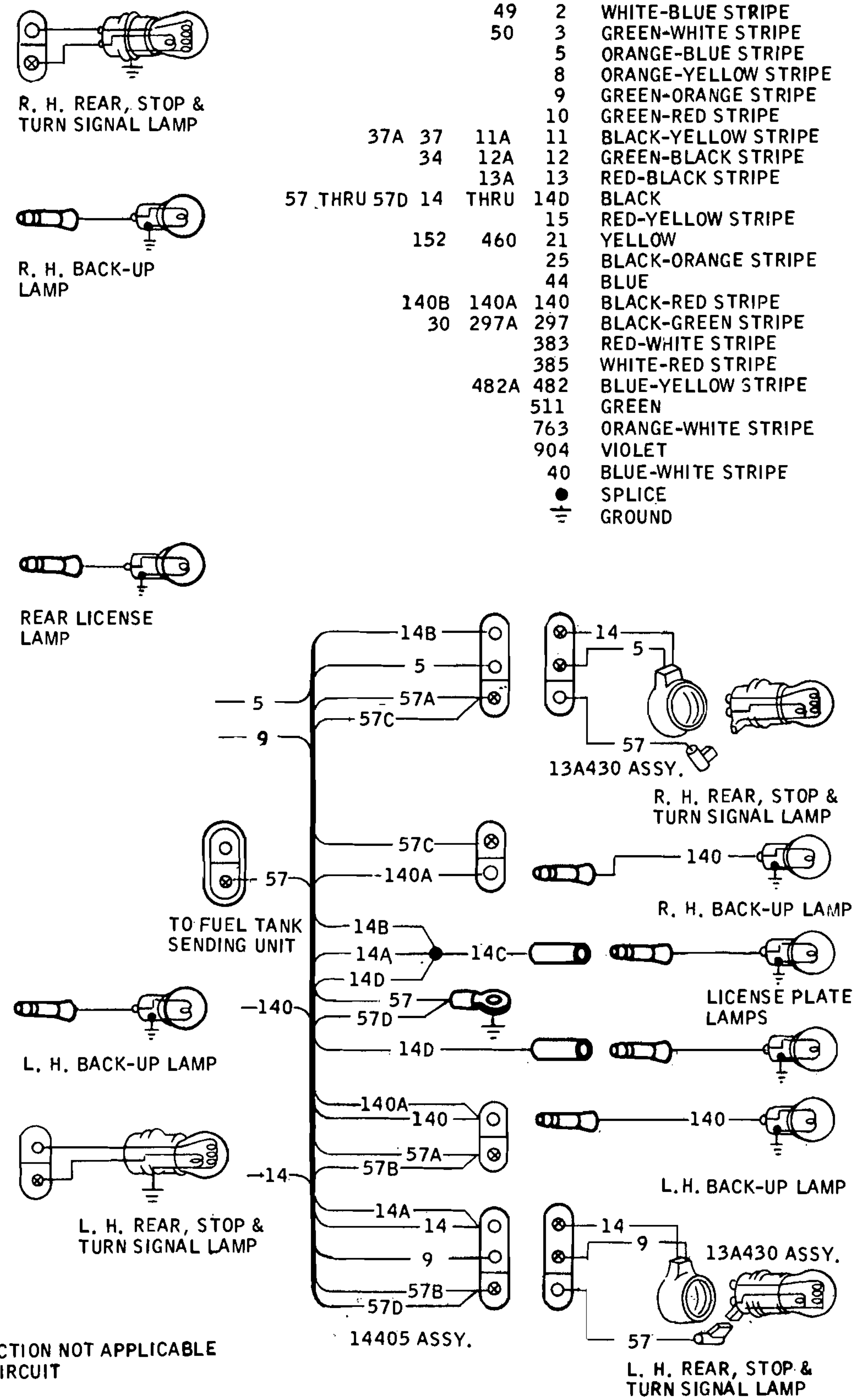


K 1723-B1

FIG. 7—Mercury Intermediate Exterior Lighting, Turn Signals and Horns

WIRING COLOR CODE

49	2	WHITE-BLUE STRIPE
50	3	GREEN-WHITE STRIPE
	5	ORANGE-BLUE STRIPE
	8	ORANGE-YELLOW STRIPE
	9	GREEN-ORANGE STRIPE
	10	GREEN-RED STRIPE
37A 37 11A	11	BLACK-YELLOW STRIPE
34 12A	12	GREEN-BLACK STRIPE
13A	13	RED-BLACK STRIPE
57 THRU 57D 14 THRU	14D	BLACK
	15	RED-YELLOW STRIPE
152 460	21	YELLOW
	25	BLACK-ORANGE STRIPE
	44	BLUE
140B 140A	140	BLACK-RED STRIPE
30 297A	297	BLACK-GREEN STRIPE
	383	RED-WHITE STRIPE
	385	WHITE-RED STRIPE
482A	482	BLUE-YELLOW STRIPE
	511	GREEN
	763	ORANGE-WHITE STRIPE
	904	VIOLET
	40	BLUE-WHITE STRIPE
	●	SPLICE
	⏚	GROUND



*NOTE:
WIRE FUNCTION NOT APPLICABLE
TO THIS CIRCUIT

MODEL 71 ONLY

K 1723-B2

FIG. 7—Mercury Intermediate Exterior Lighting, Turn Signals and Horns (Continued)

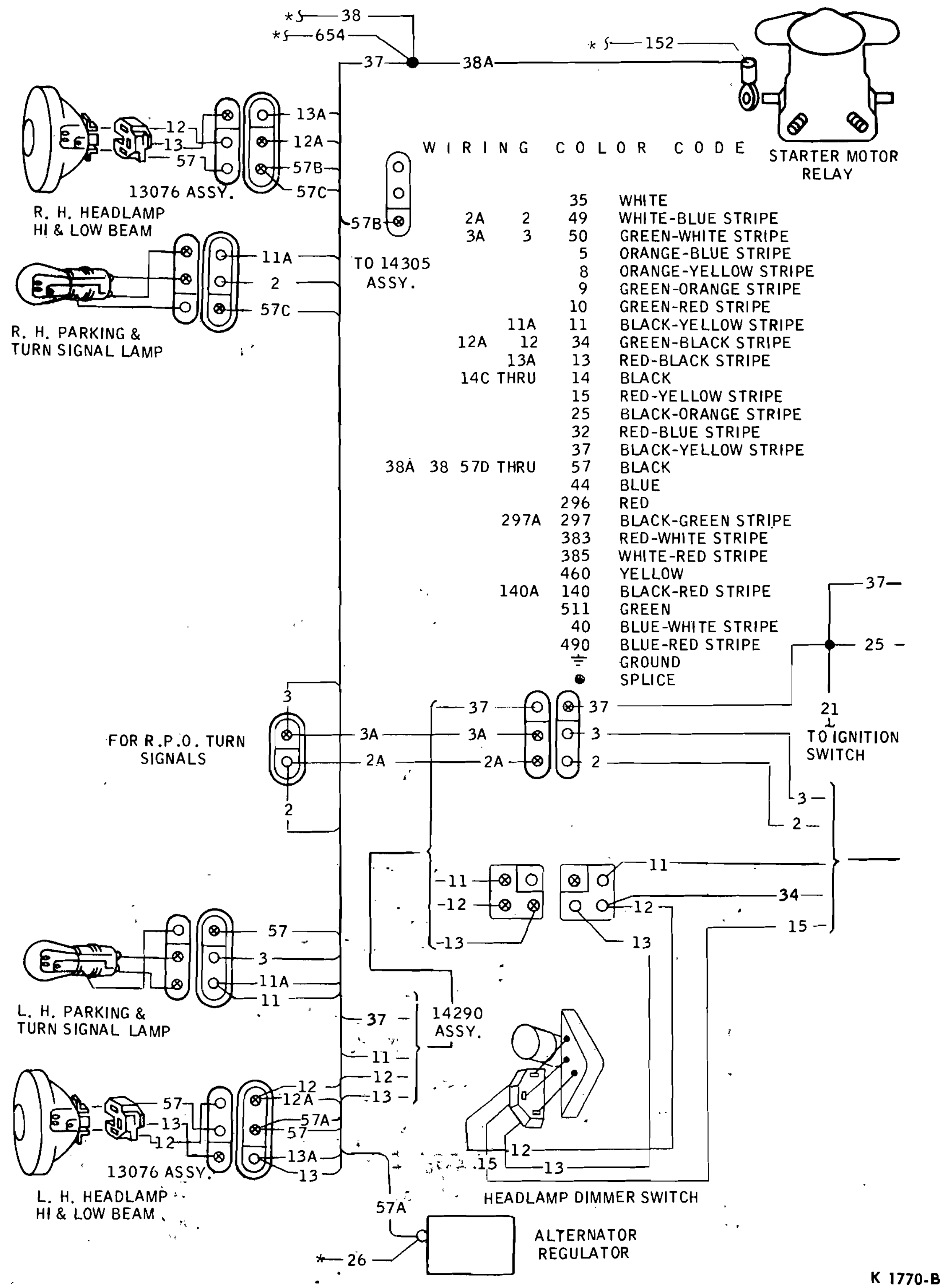
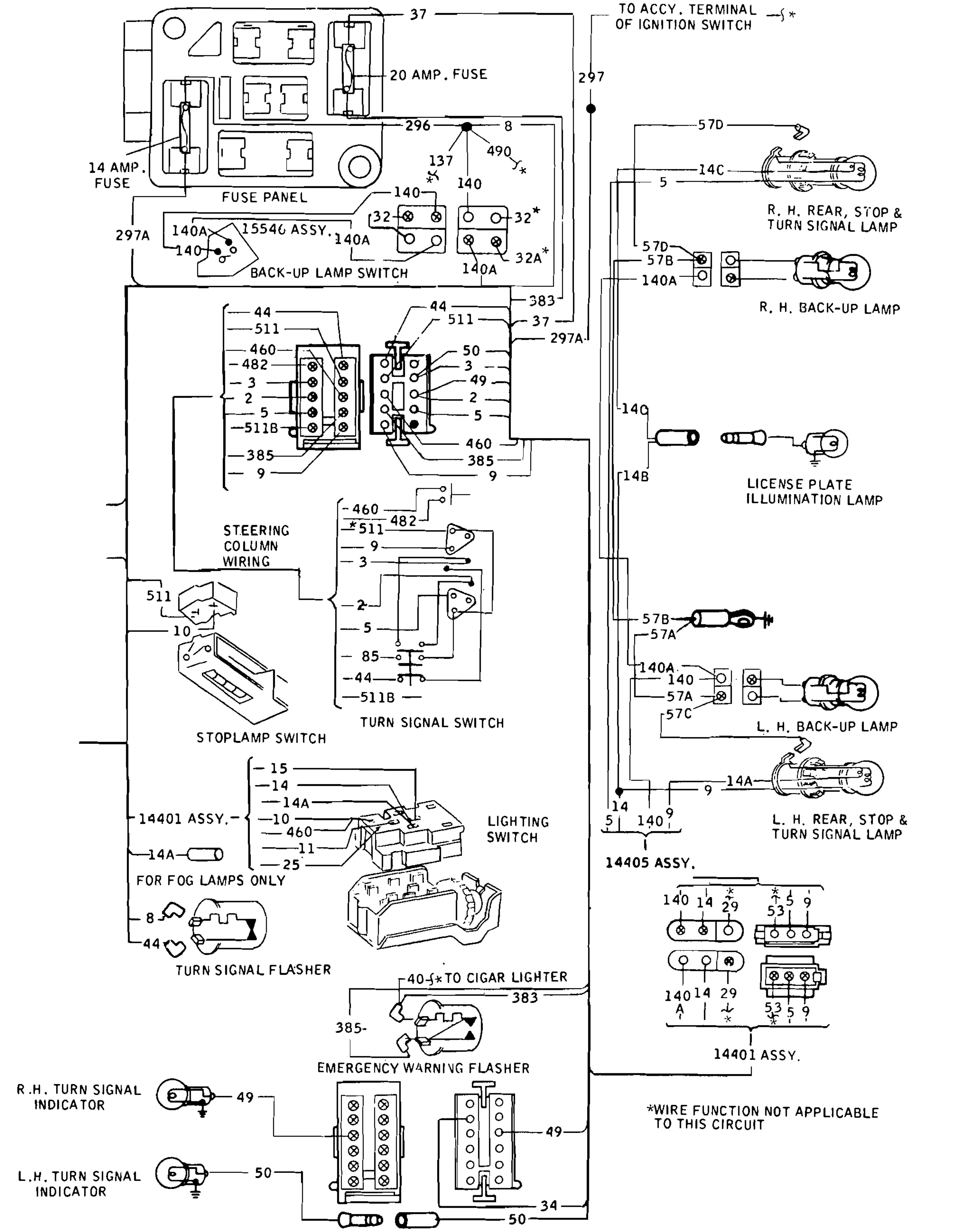


FIG. 8—Mustang Exterior Lighting and Turn Signals



K 1770-B2

FIG. 8—Mustang Exterior Lighting and Turn Signals (Continued)

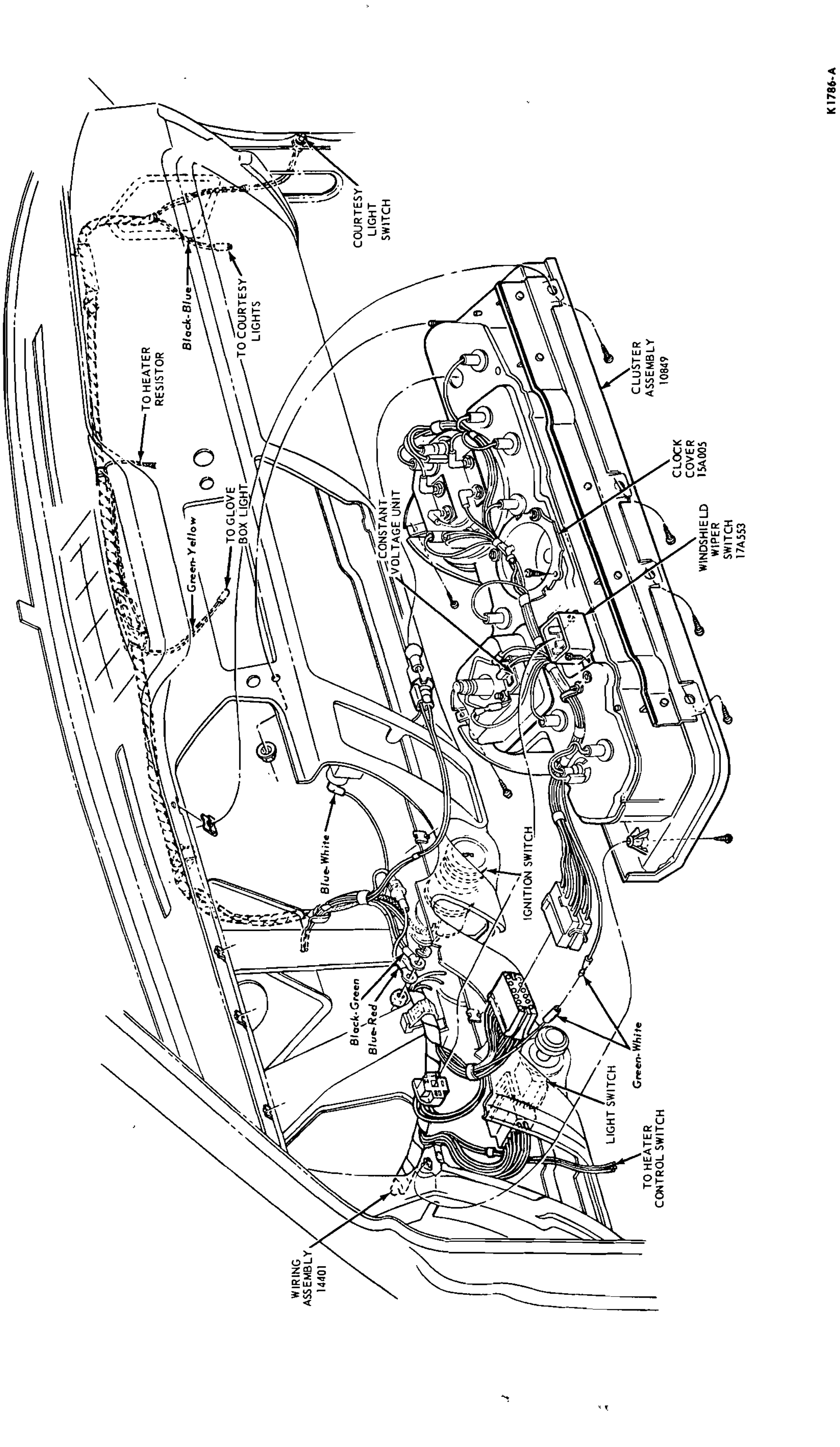


FIG. 9—Cougar Instrument Panel

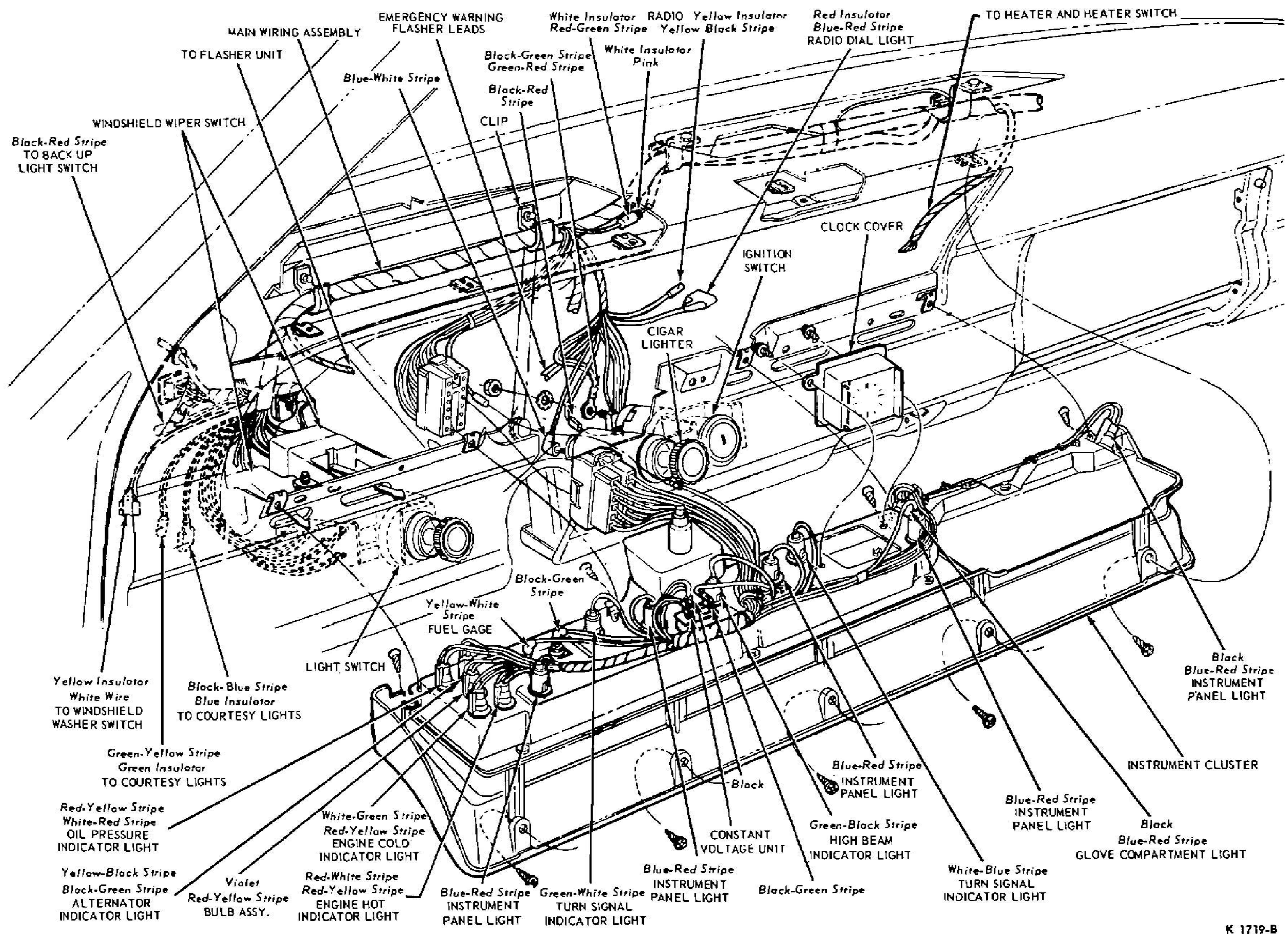


FIG. 10—Fairlane Instrument Panel

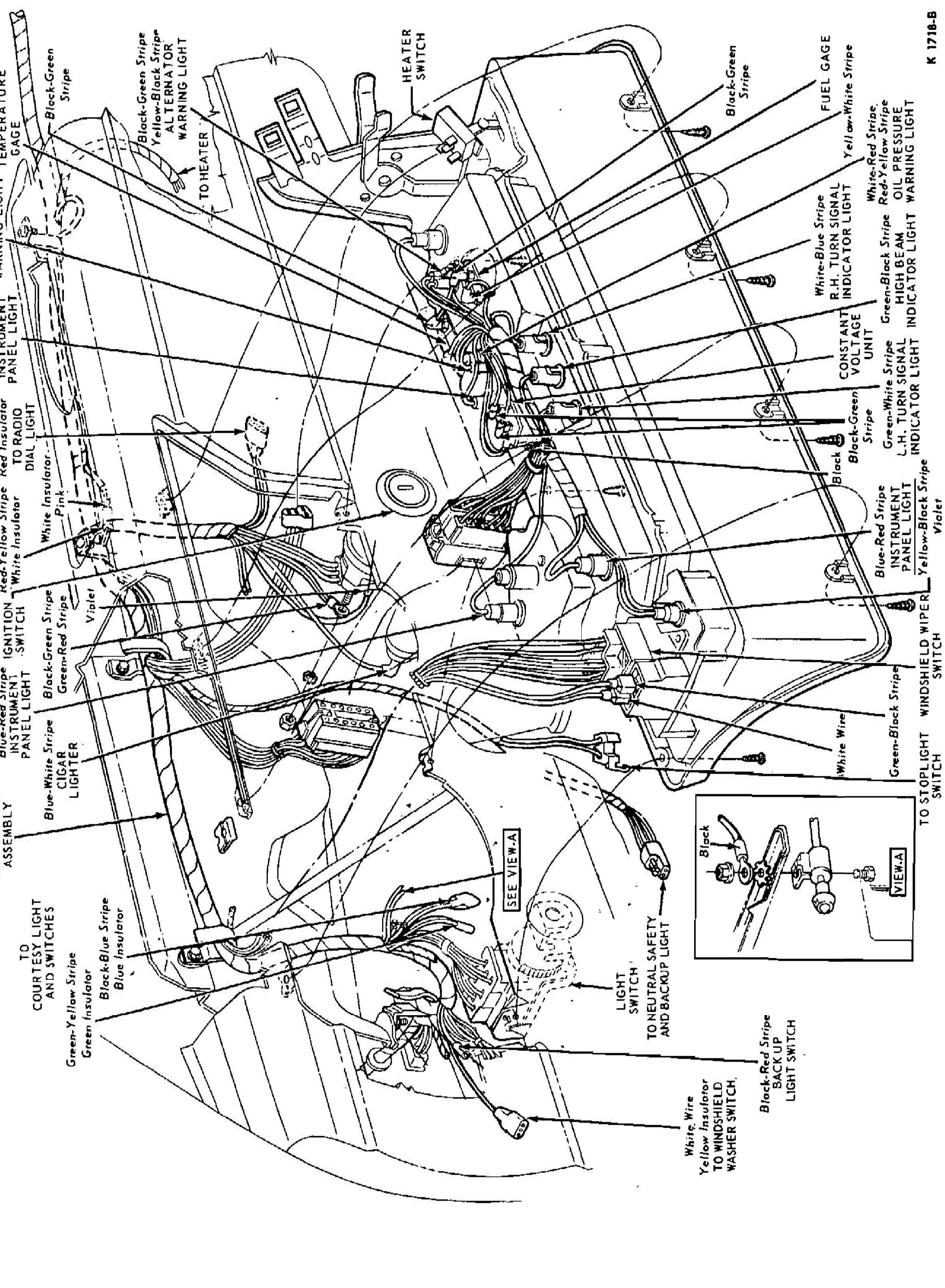


FIG. 11—Falcon Instrument Panel

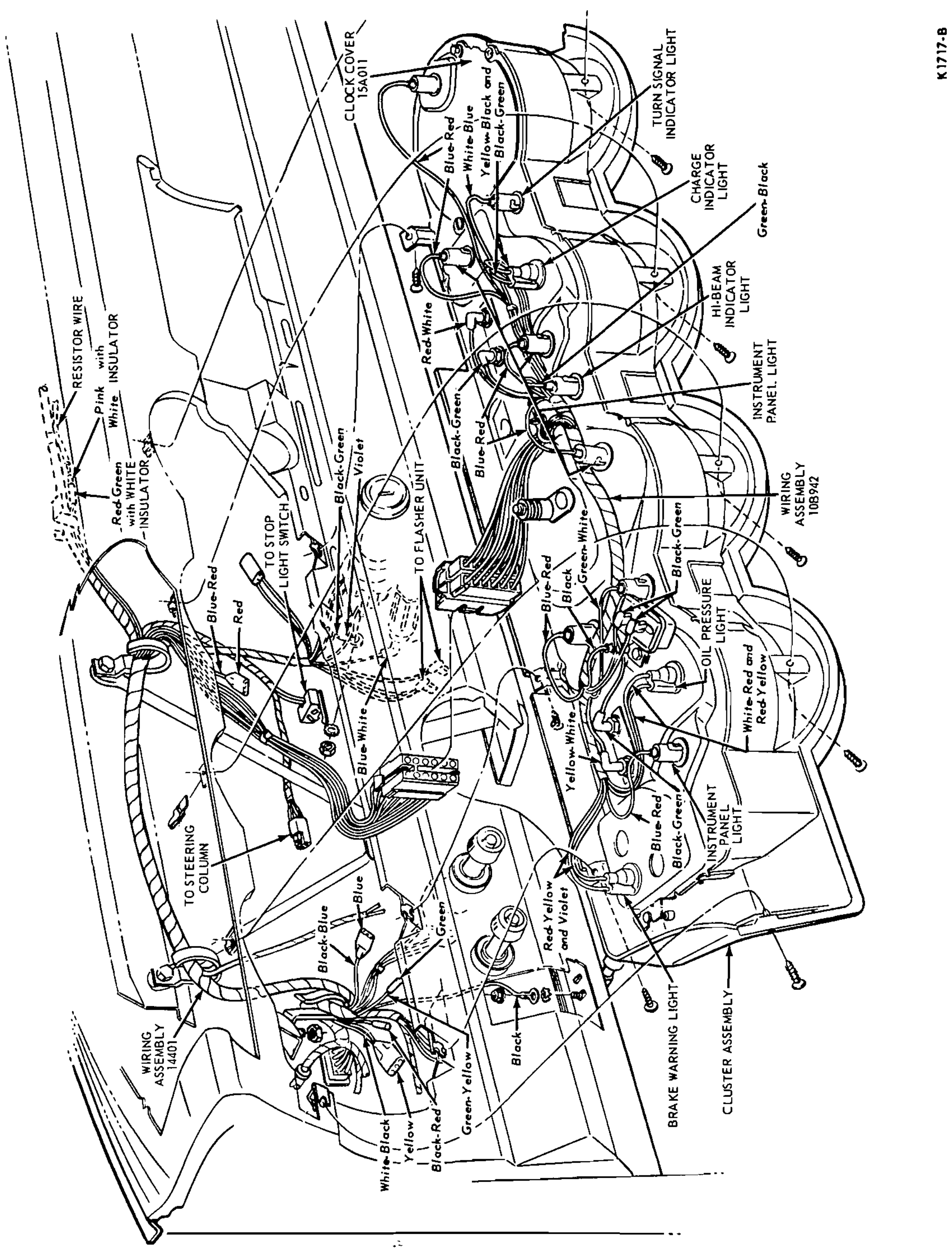


FIG. 12—Mercury Intermediate Instrument Panel

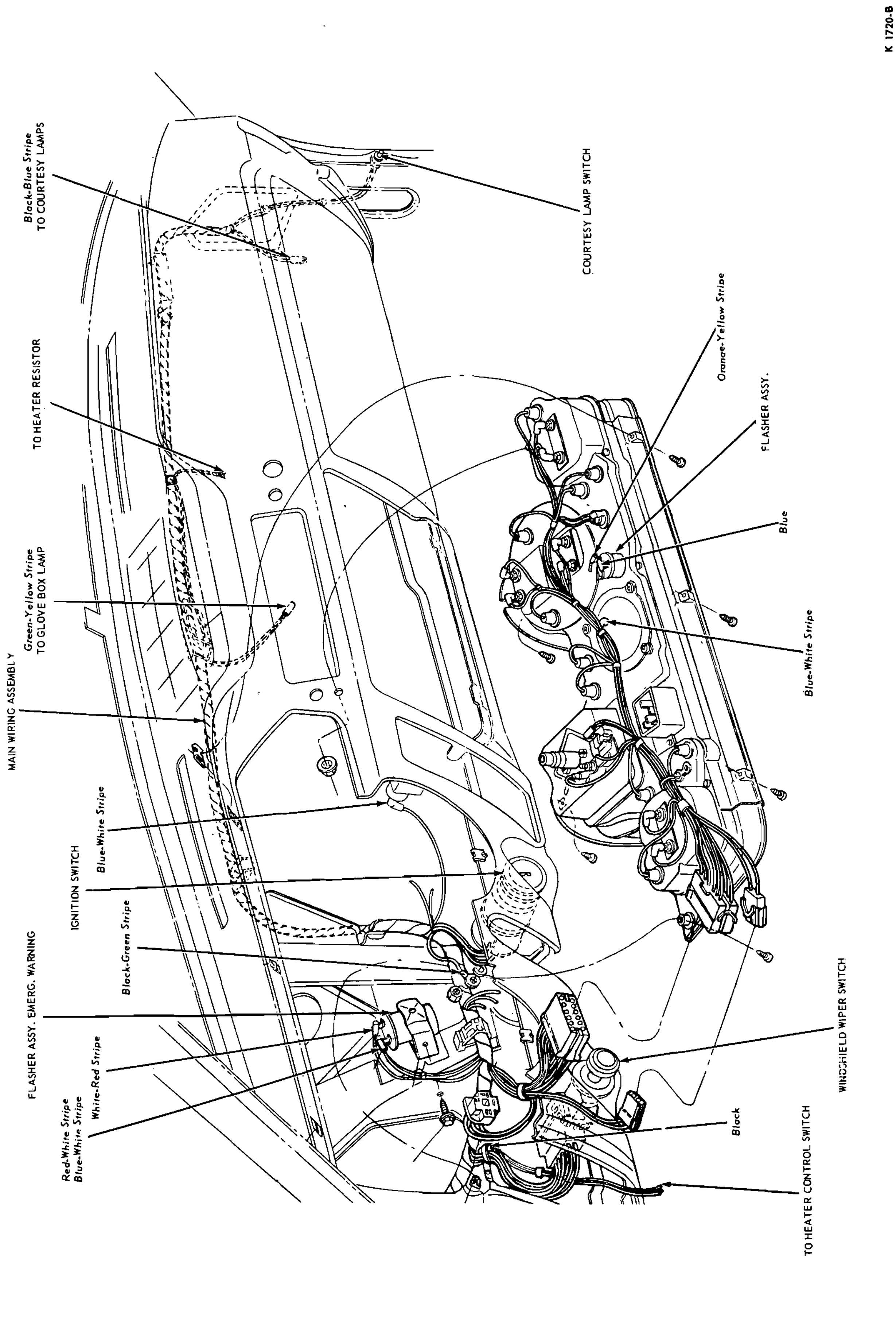


FIG. 13—Mustang Instrument Panel

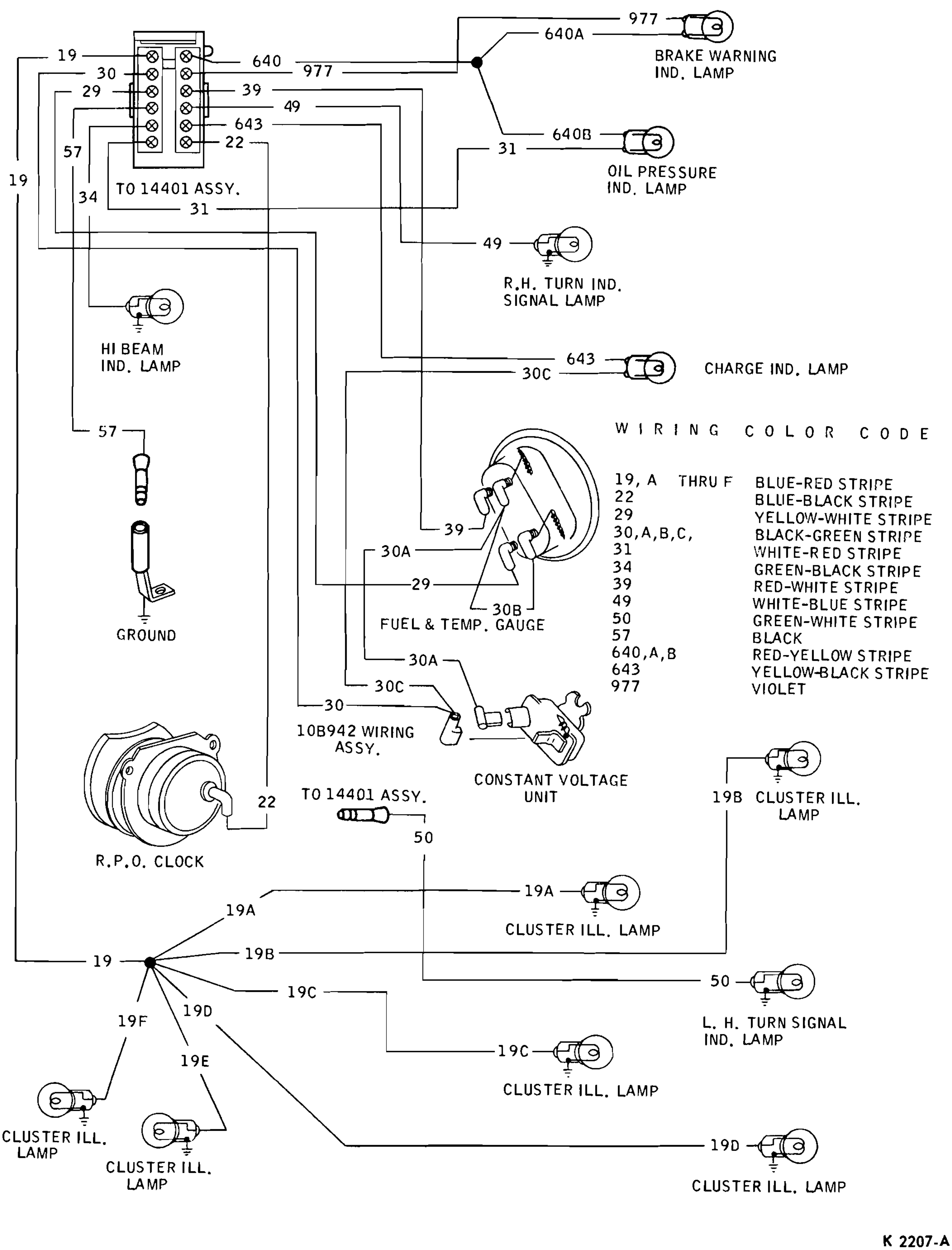
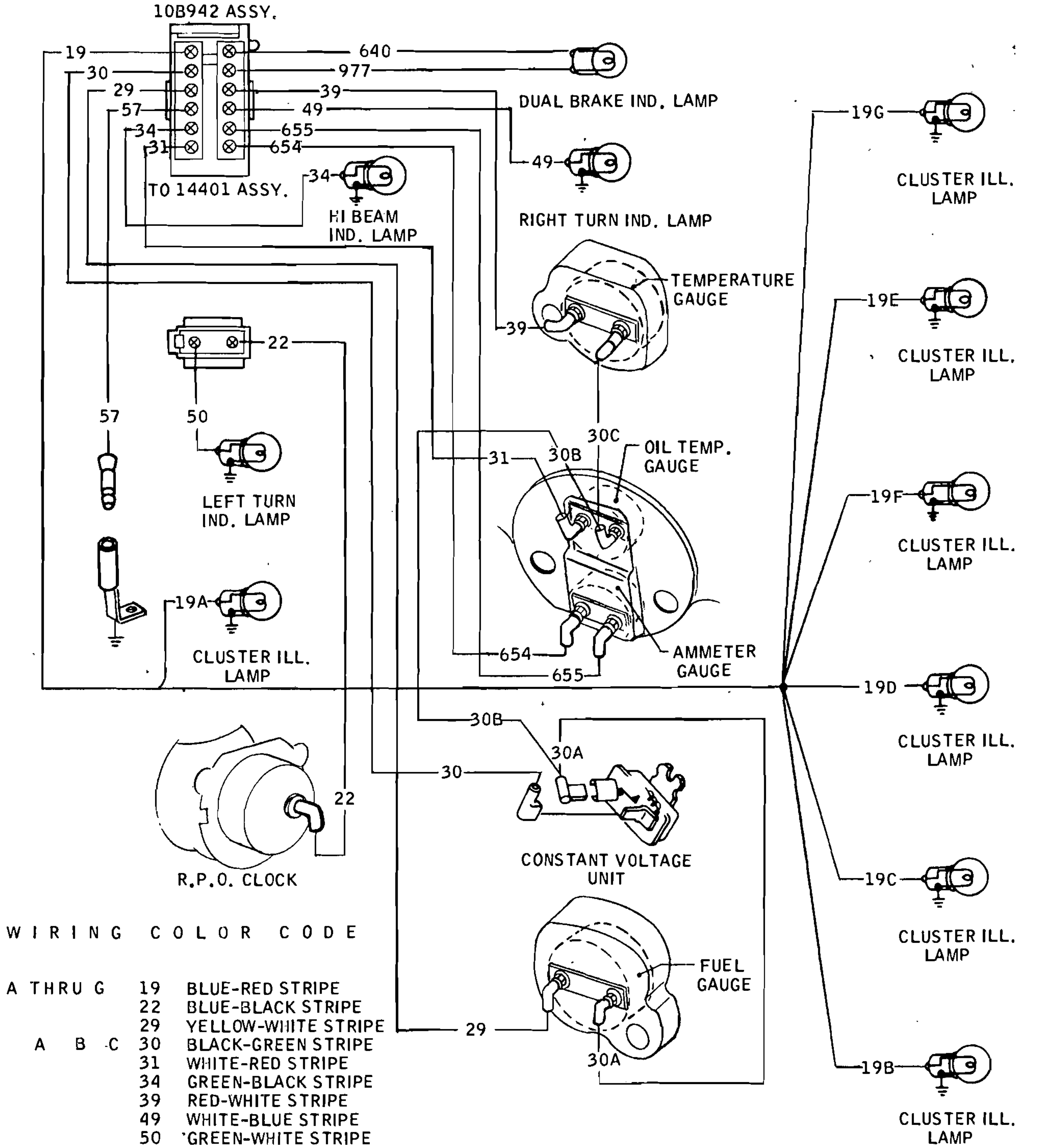


FIG. 14—Cougar Pre-Wired Instrument Cluster

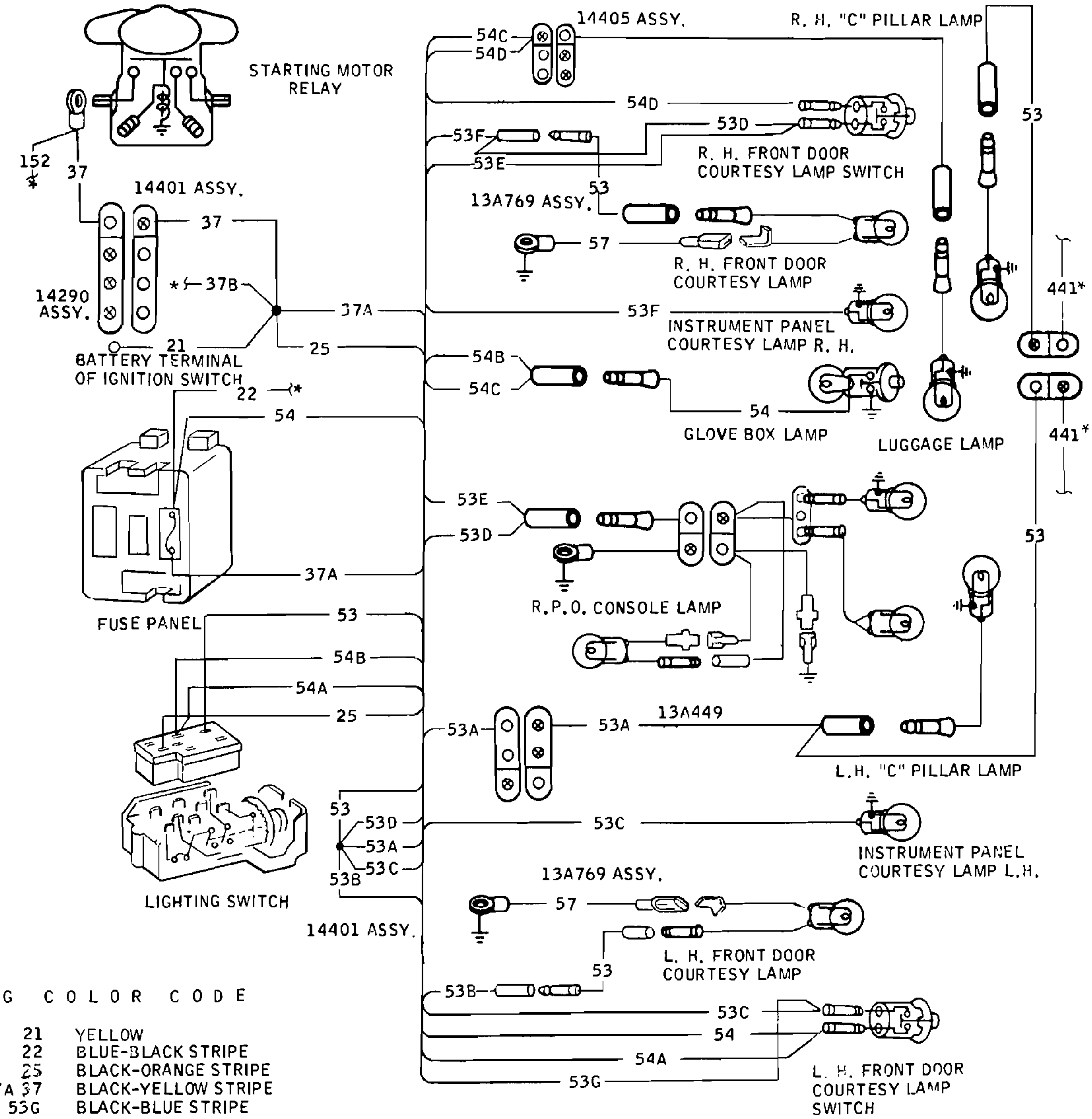


WIRING COLOR CODE

A THRU G	19	BLUE-RED STRIPE
	22	BLUE-BLACK STRIPE
	29	YELLOW-WHITE STRIPE
A B C	30	BLACK-GREEN STRIPE
	31	WHITE-RED STRIPE
	34	GREEN-BLACK STRIPE
	39	RED-WHITE STRIPE
	49	WHITE-BLUE STRIPE
	50	GREEN-WHITE STRIPE
	57	BLACK
	640	RED-YELLOW STRIPE
	654	VIOLET
	655	YELLOW
	977	VIOLET
	●	SPLICE
	⏚	GROUND

K 1790-B

FIG. 15—Mustang Pre-Wired Instrument Cluster



WIRING COLOR CODE

21	YELLOW
22	BLUE-BLACK STRIPE
25	BLACK-ORANGE STRIPE
37B 37A 37	BLACK-YELLOW STRIPE
53 THRU 53G	BLACK-BLUE STRIPE
54 THRU 54D	GREEN-YELLOW STRIPE
57A 57	BLACK
●	SPLICE
⏚	GROUND
441	VIOLET

*NOTE:
WIRE FUNCTION NOT APPLICABLE TO THIS CIRCUIT

K 1789-B

FIG. 16—Cougar Interior Lighting

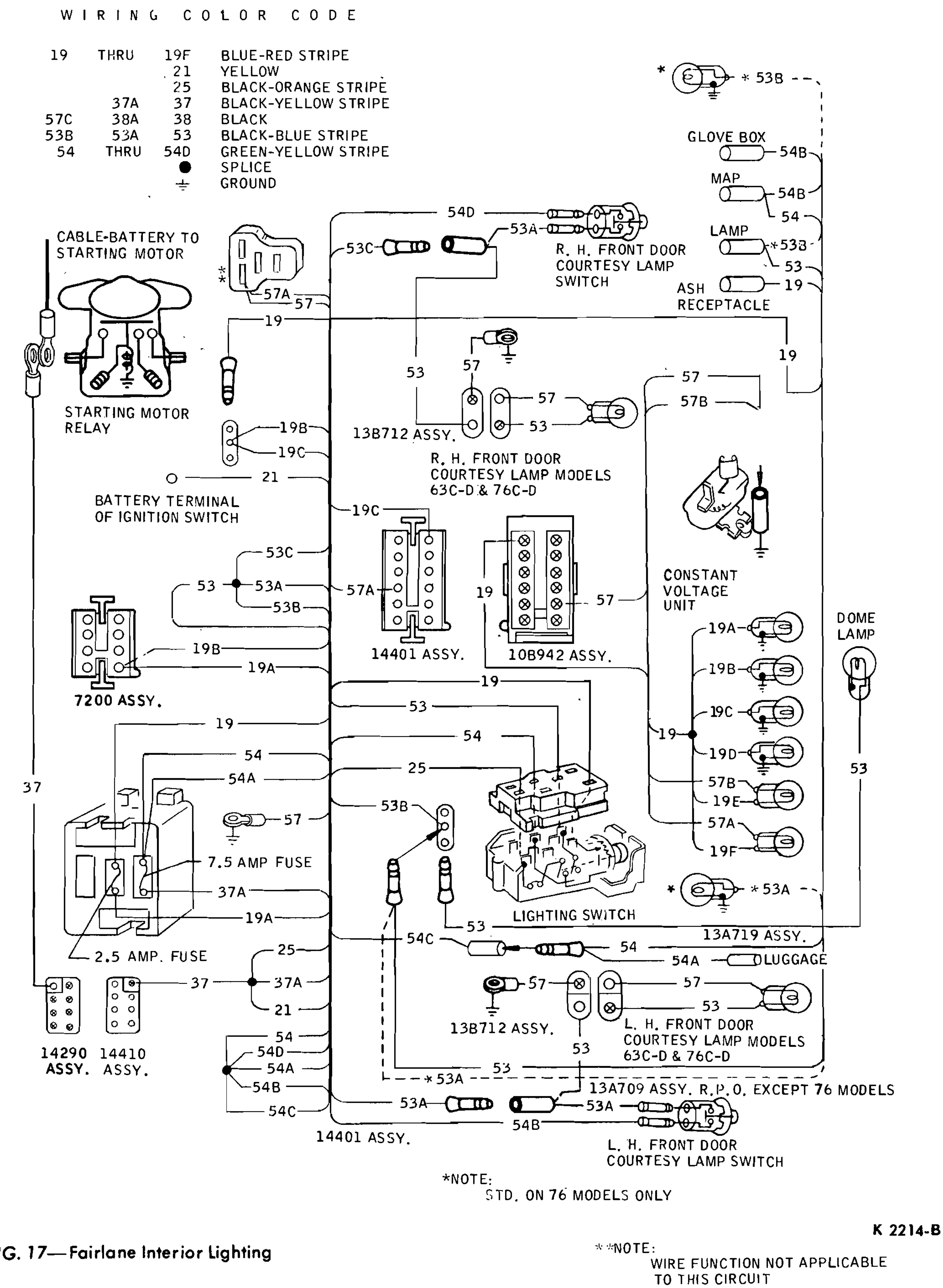
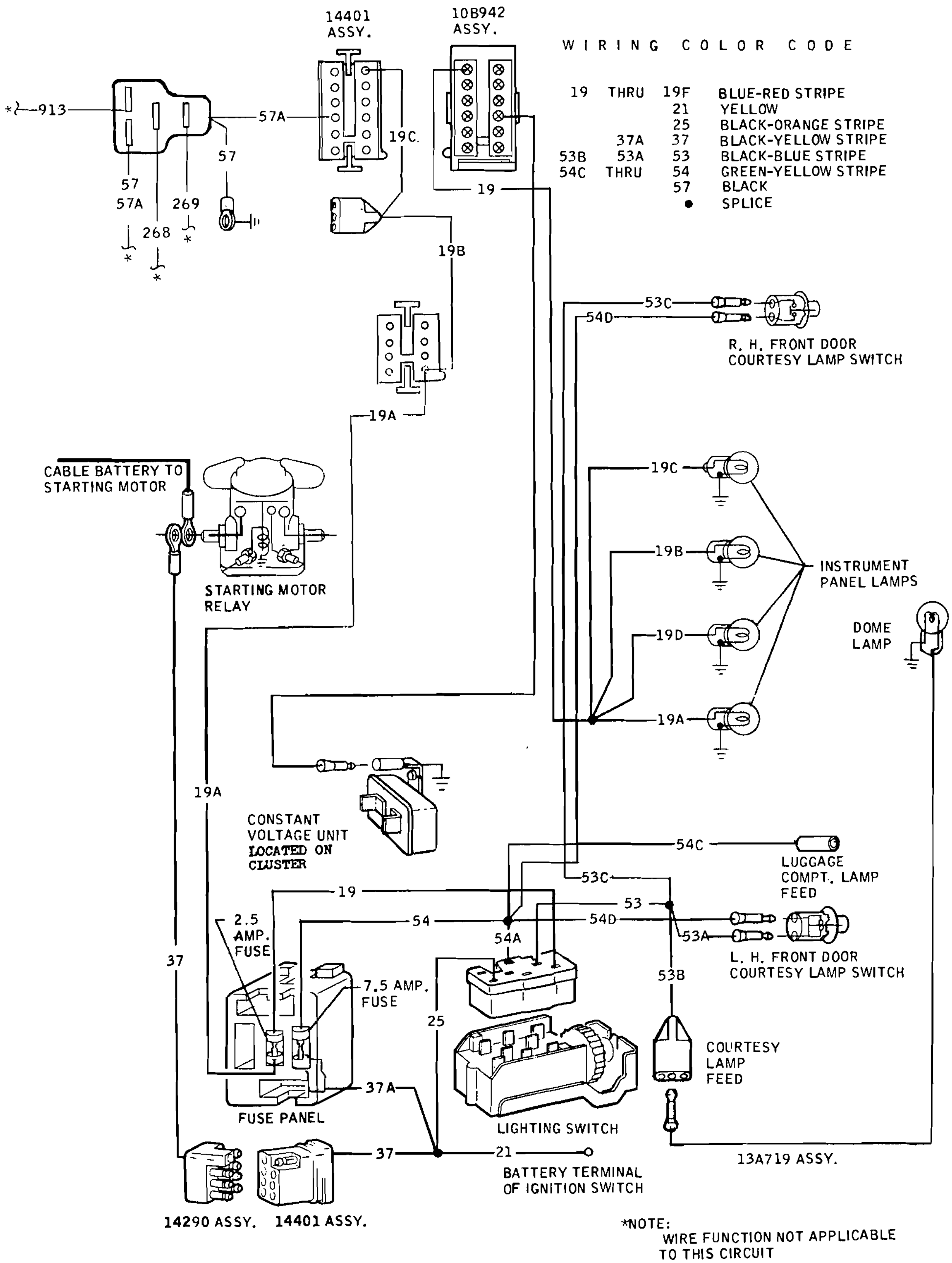


FIG. 17—Fairlane Interior Lighting



K 2229-B

FIG. 18—Falcon Interior Lighting

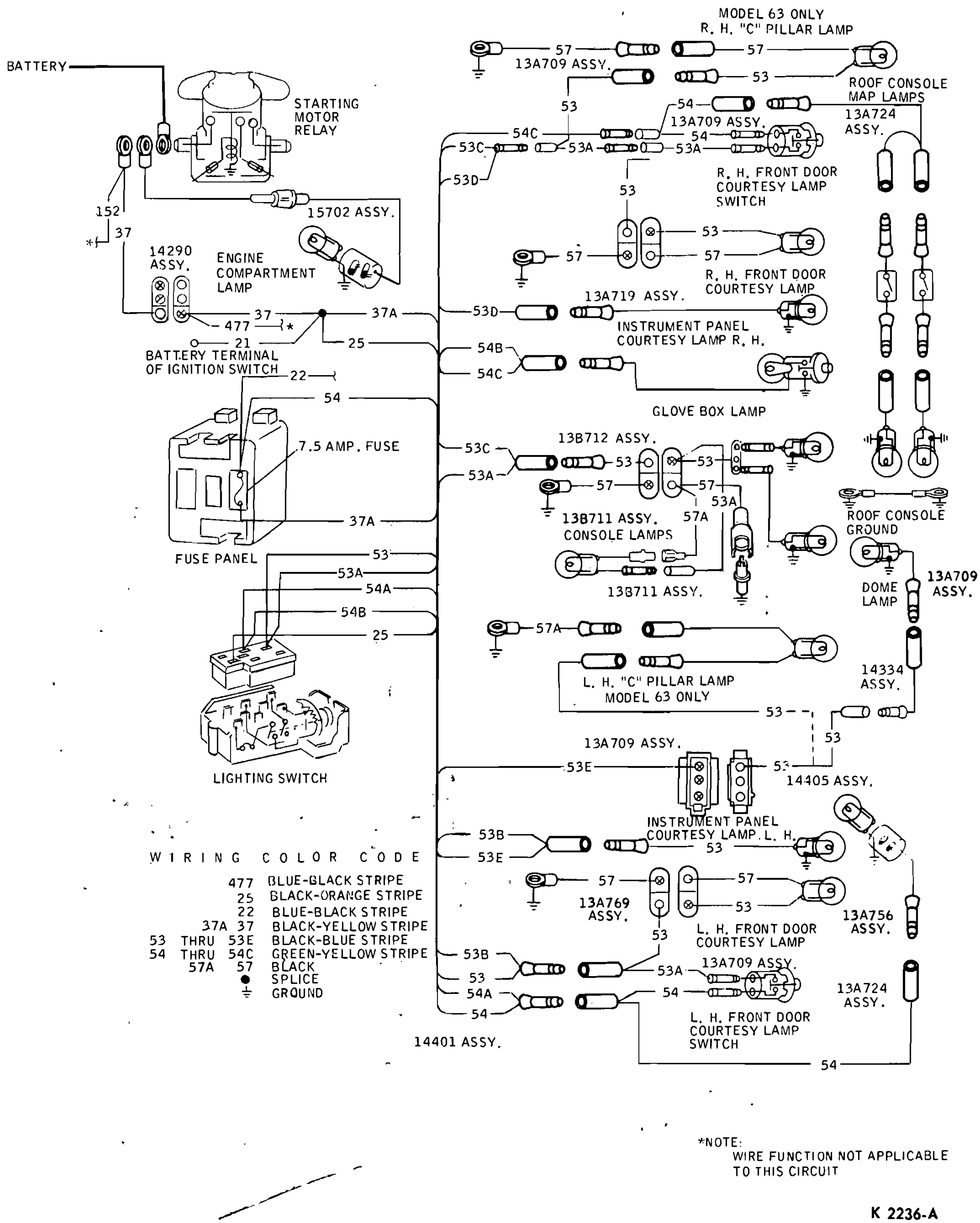
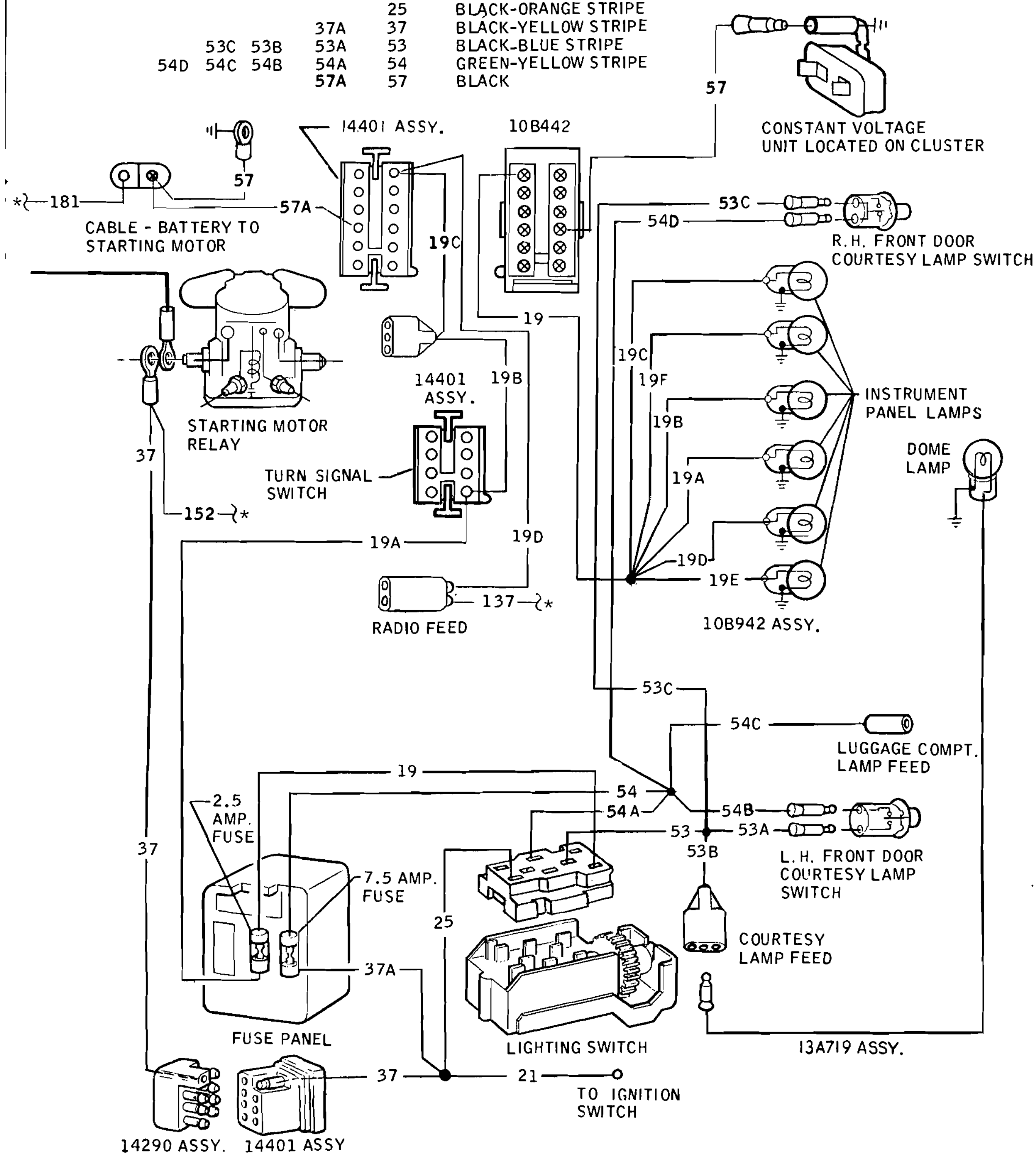


FIG. 19—Mustang Interior Lighting

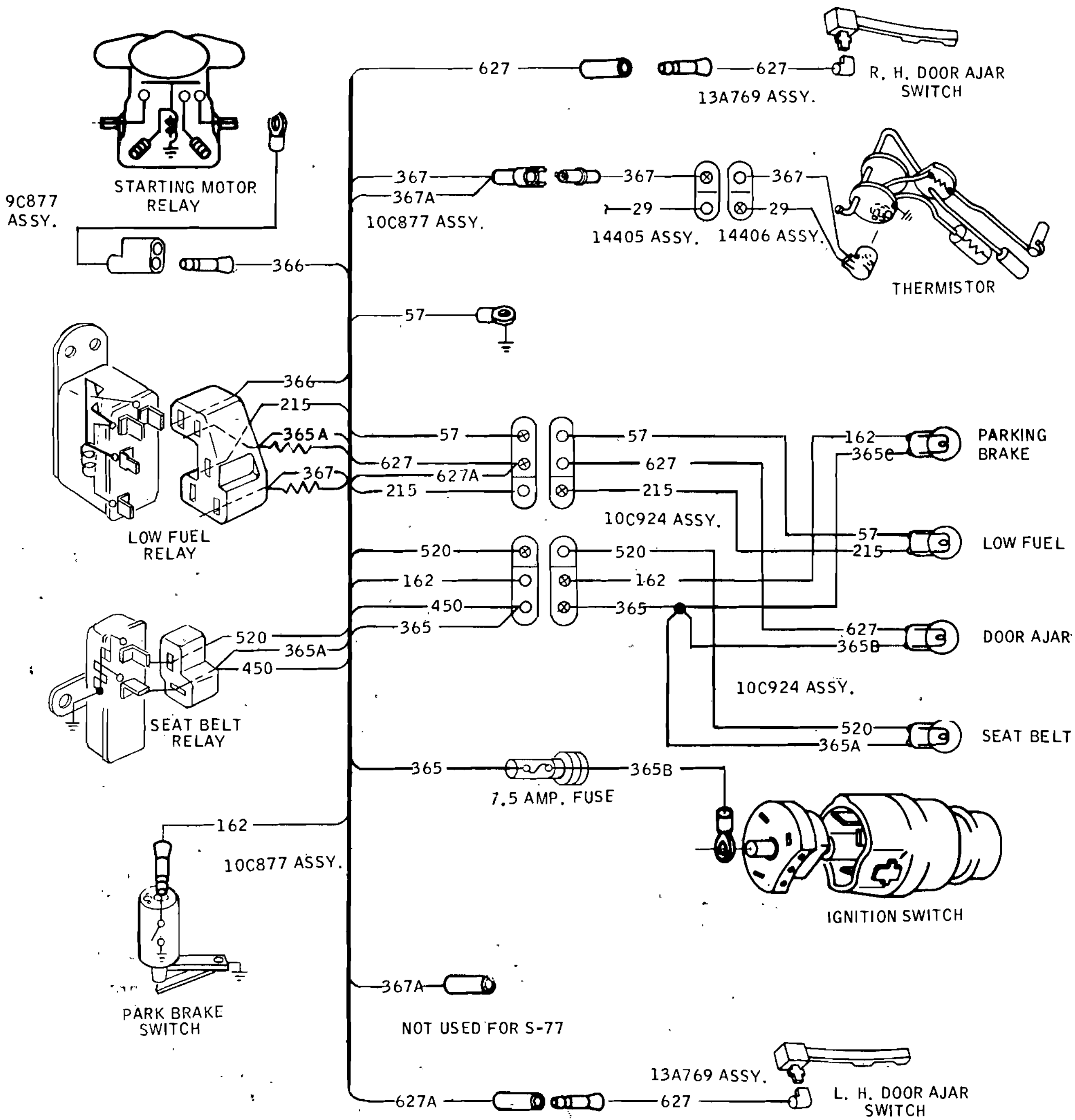
WIRING COLOR CODE

	19	THRU		19F	BLUE-RED STRIPE
				21	YELLOW
				25	BLACK-ORANGE STRIPE
			37A	37	BLACK-YELLOW STRIPE
	53C	53B	53A	53	BLACK-BLUE STRIPE
54D	54C	54B	54A	54	GREEN-YELLOW STRIPE
			57A	57	BLACK



K 1788-B

*FIG. 20—*Mercury Intermediate Interior Lighting



WIRING COLOR CODE

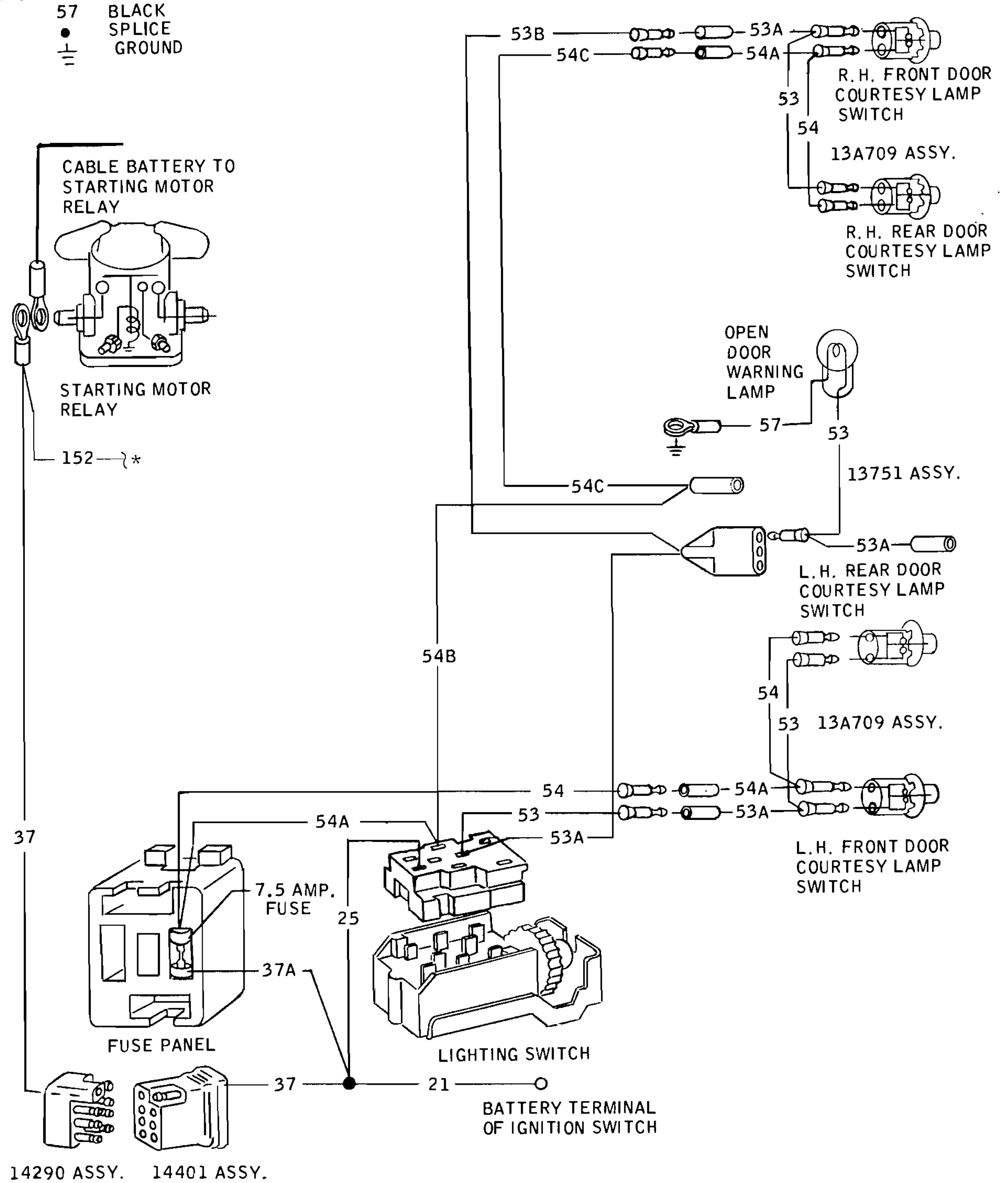
	57	BLACK	450	GREEN
	162	GREEN-RED STRIPE	520	VIOLET
	215	YELLOW-BLACK STRIPE	627A 627	BLACK-VIOLET STRIPE
365 THRU	365C	BLUE-RED STRIPE	●	SPLICE
367A	367	GREEN-WHITE STRIPE	⏚	GROUND
	366	RED		
	29	YELLOW-WHITE STRIPE		

K 2217-B

FIG. 21—Cougar, Mustang Convenience Control Panel

WIRING COLOR CODE

		21	YELLOW
		25	BLACK-ORANGE STRIPE
	37A	37	BLACK-YELLOW STRIPE
53B	53A	53	BLACK-BLUE STRIPE
54C	THRU	54	GREEN-YELLOW STRIPE
		57	BLACK
		●	SPLICE
		⏚	GROUND



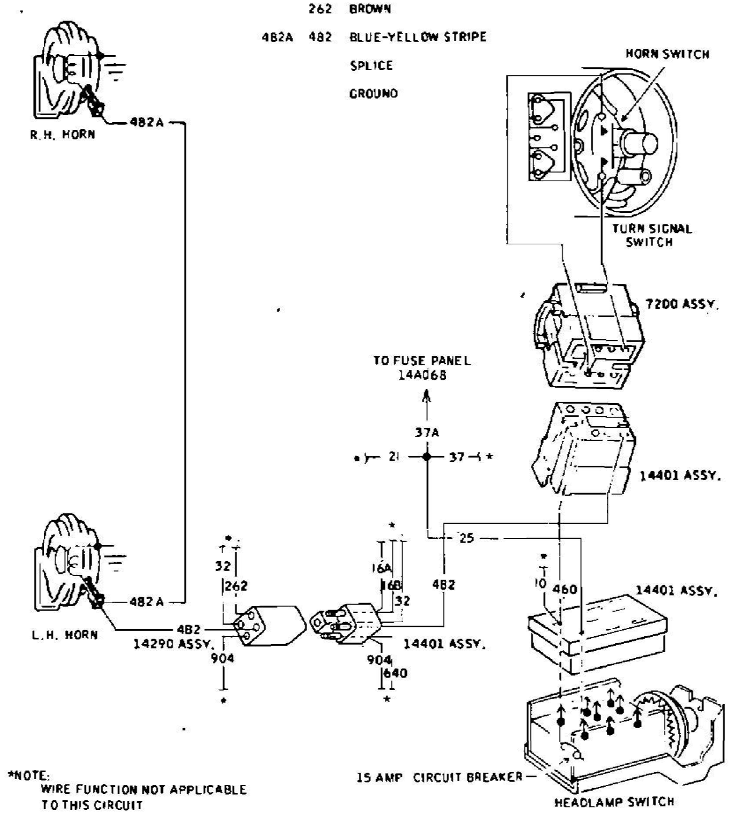
*NOTE:
WIRE FUNCTION NOT APPLICABLE TO THIS CIRCUIT

K 1785-A

FIG. 22—Falcon, Fairlane, Mercury Intermediate Open Door Warning

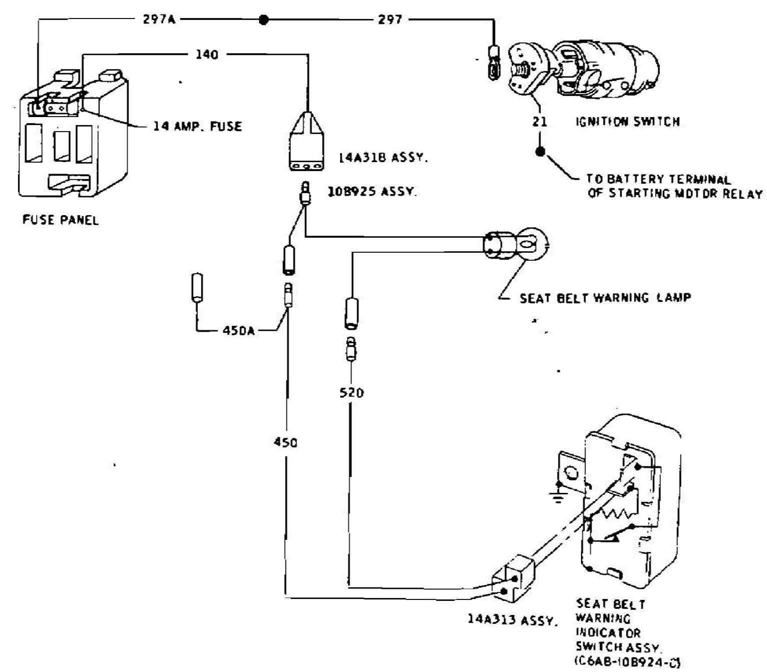
WIRING COLOR CODE

904	10	GREEN-RED STRIPE
16B	16A	RED-GREEN STRIPE
460	21	YELLOW
	25	BLACK-ORANGE STRIPE
	32	RED-BLUE STRIPE
37A	37	BLACK-YELLOW STRIPE
	262	BROWN
482A	482	BLUE-YELLOW STRIPE
		SPLICE
		GROUND



*NOTE:
WIRE FUNCTION NOT APPLICABLE TO THIS CIRCUIT

HORN CIRCUIT



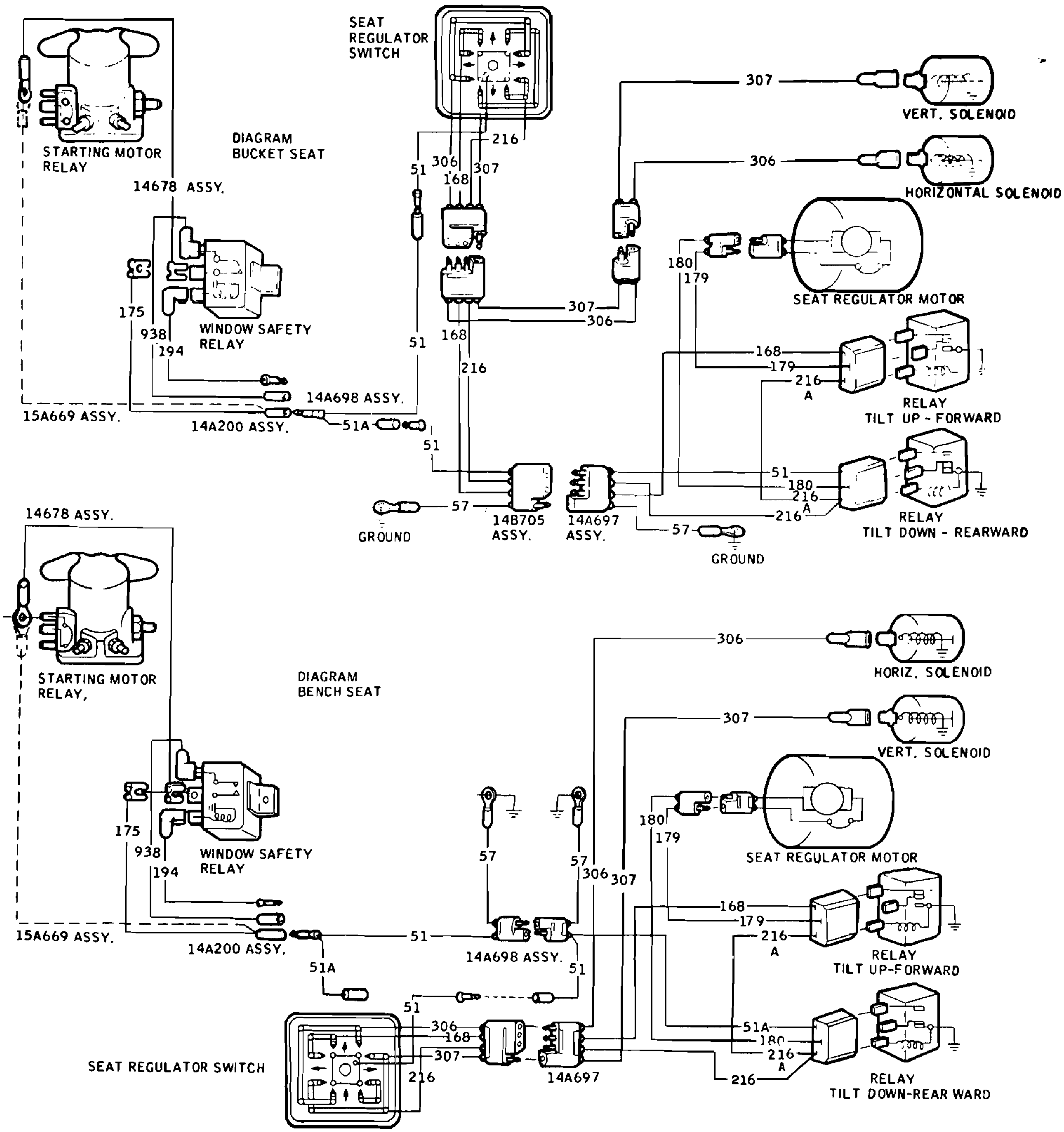
WIRING COLOR CODE

	140	BLACK-RED STRIPE
	21	YELLOW
297A	297	BLACK-GREEN STRIPE
	520	VIOLET
450A	450	GREEN
		SPLICE

SEAT BELT WARNING

K 2231-A

FIG. 23—Mustang Horns and Falcon, Fairlane, Mercury Intermediate Seat Belt Warning

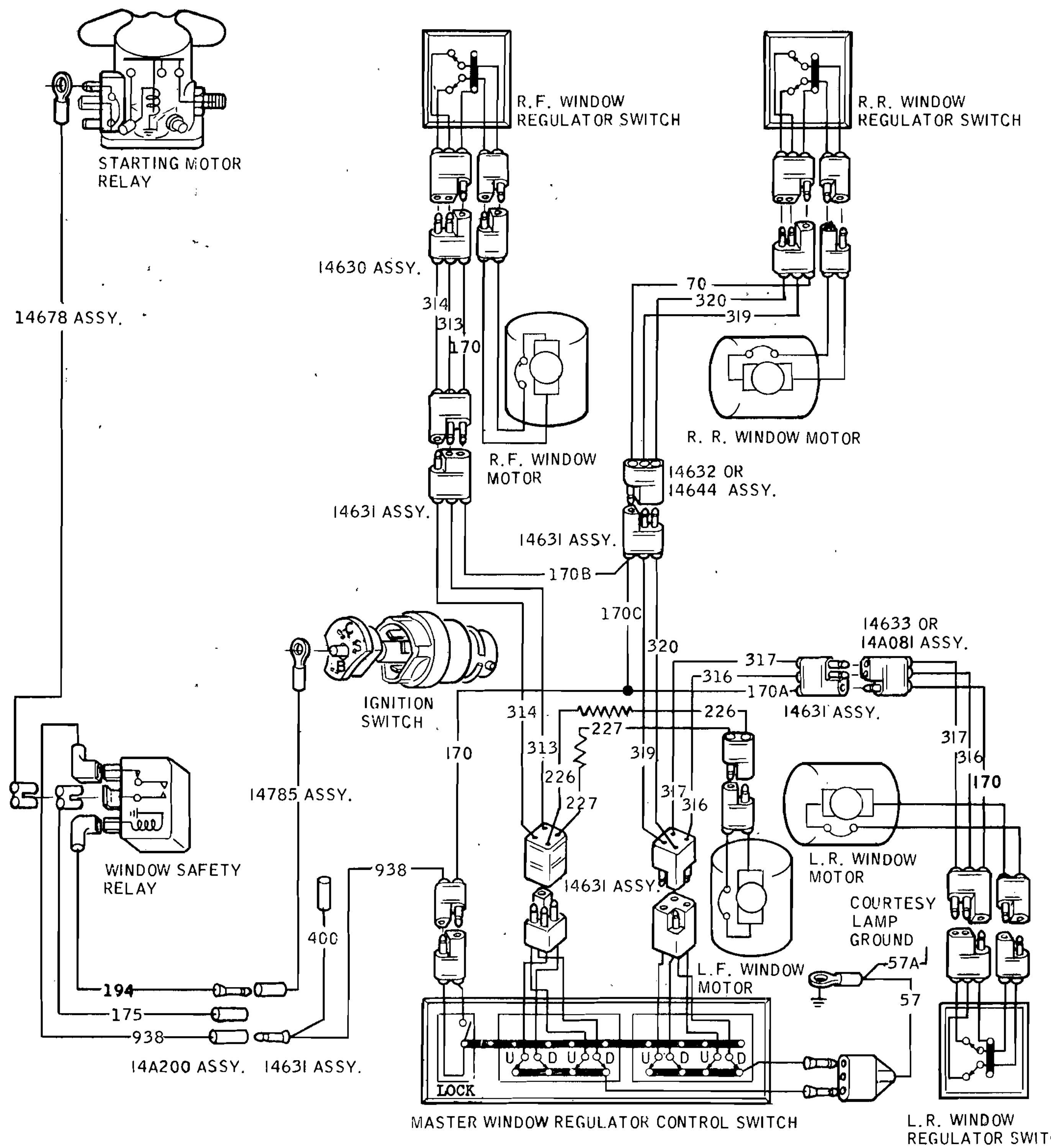


WIRING COLOR CODE

938 51	BLACK-WHITE STRIPE
175 57	BLACK
168	GREEN-YELLOW STRIPE
179	YELLOW
180	RED
216a 216	RED-YELLOW STRIPE
306	BLUE
307	WHITE

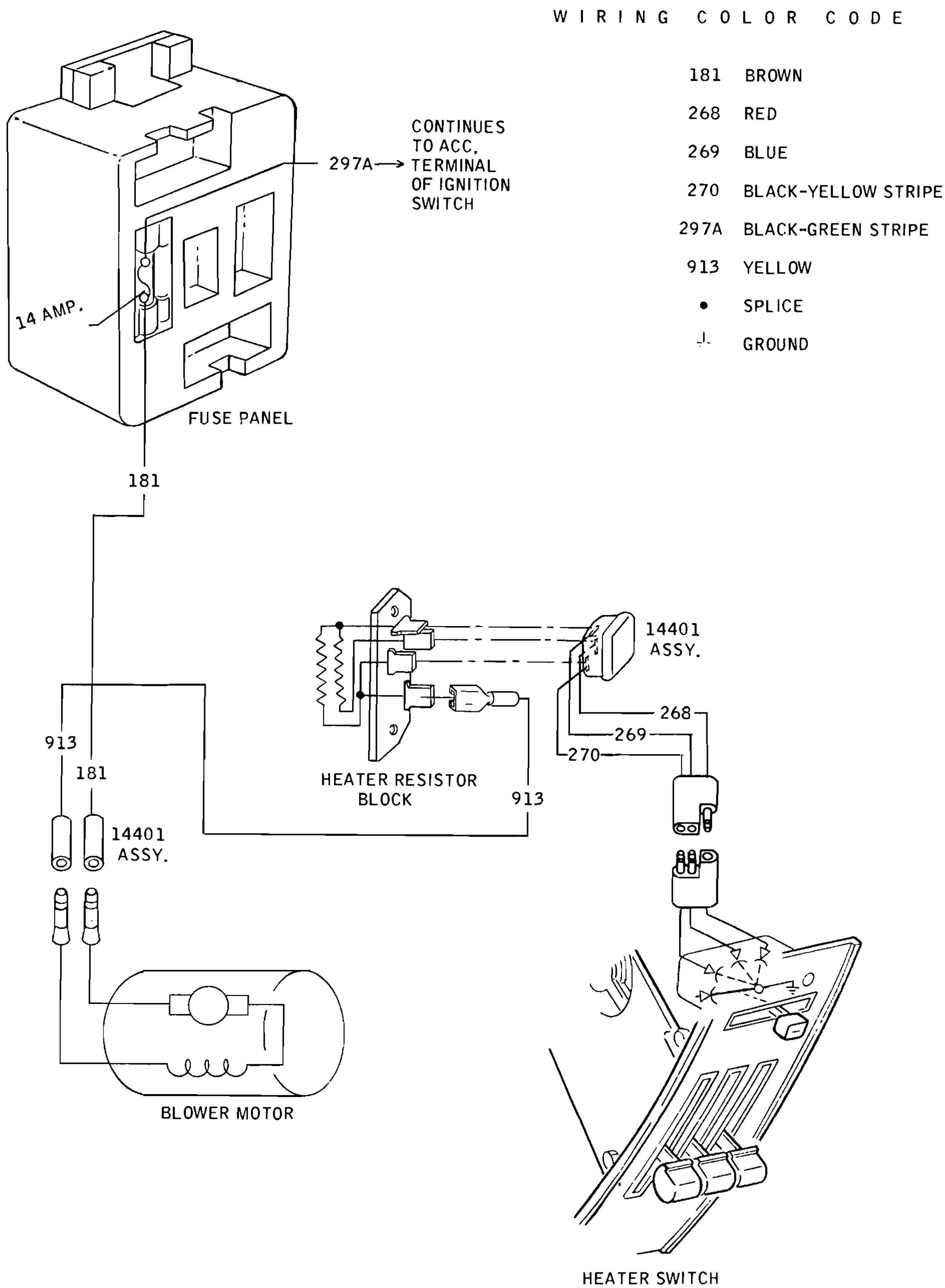
K1728-A

Fig. 24—Mercury Intermediate 4-Way Power Bench and Bucket Seats



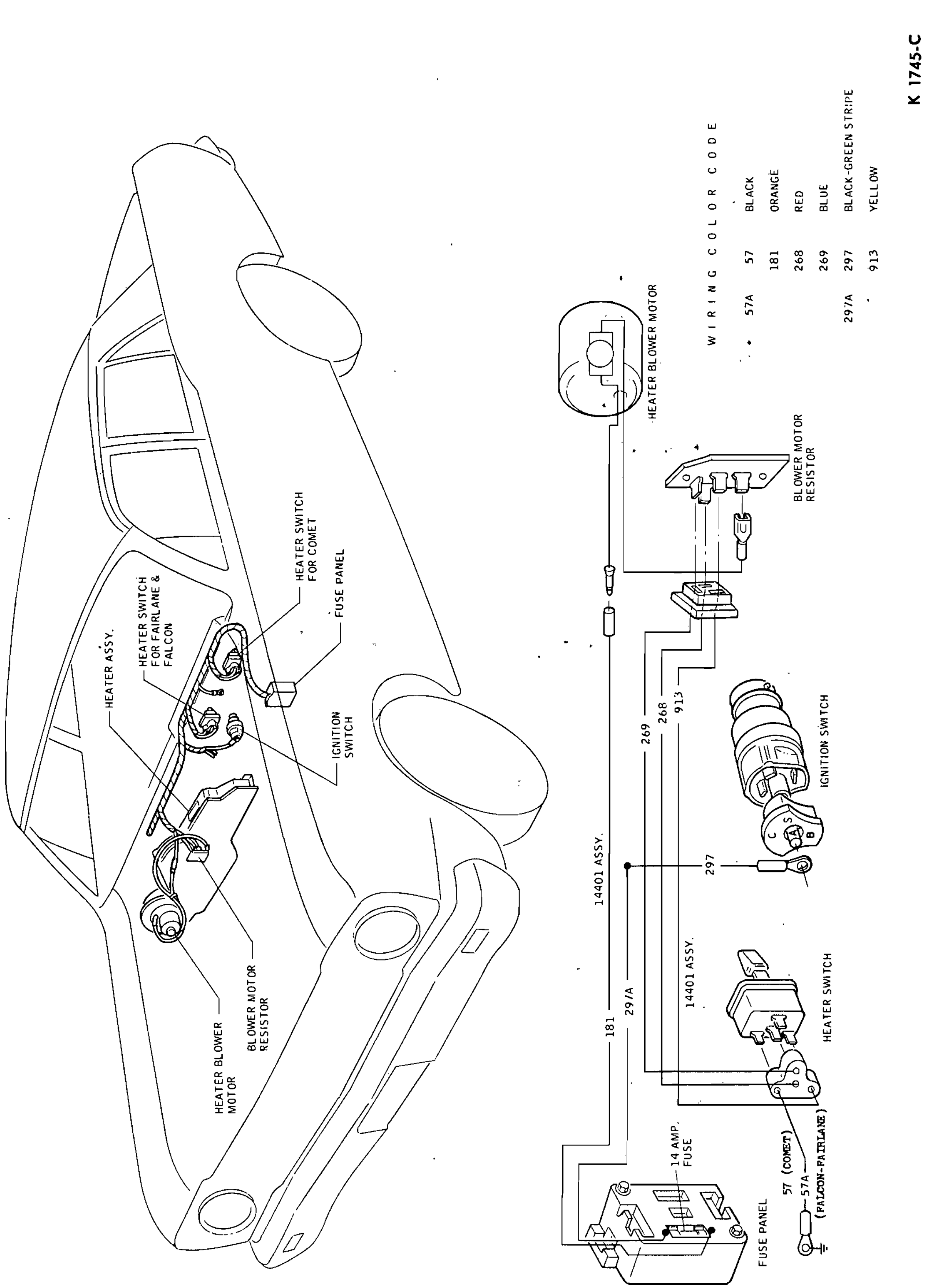
K 1727-B

FIG. 25—Mercury Intermediate Power Windows



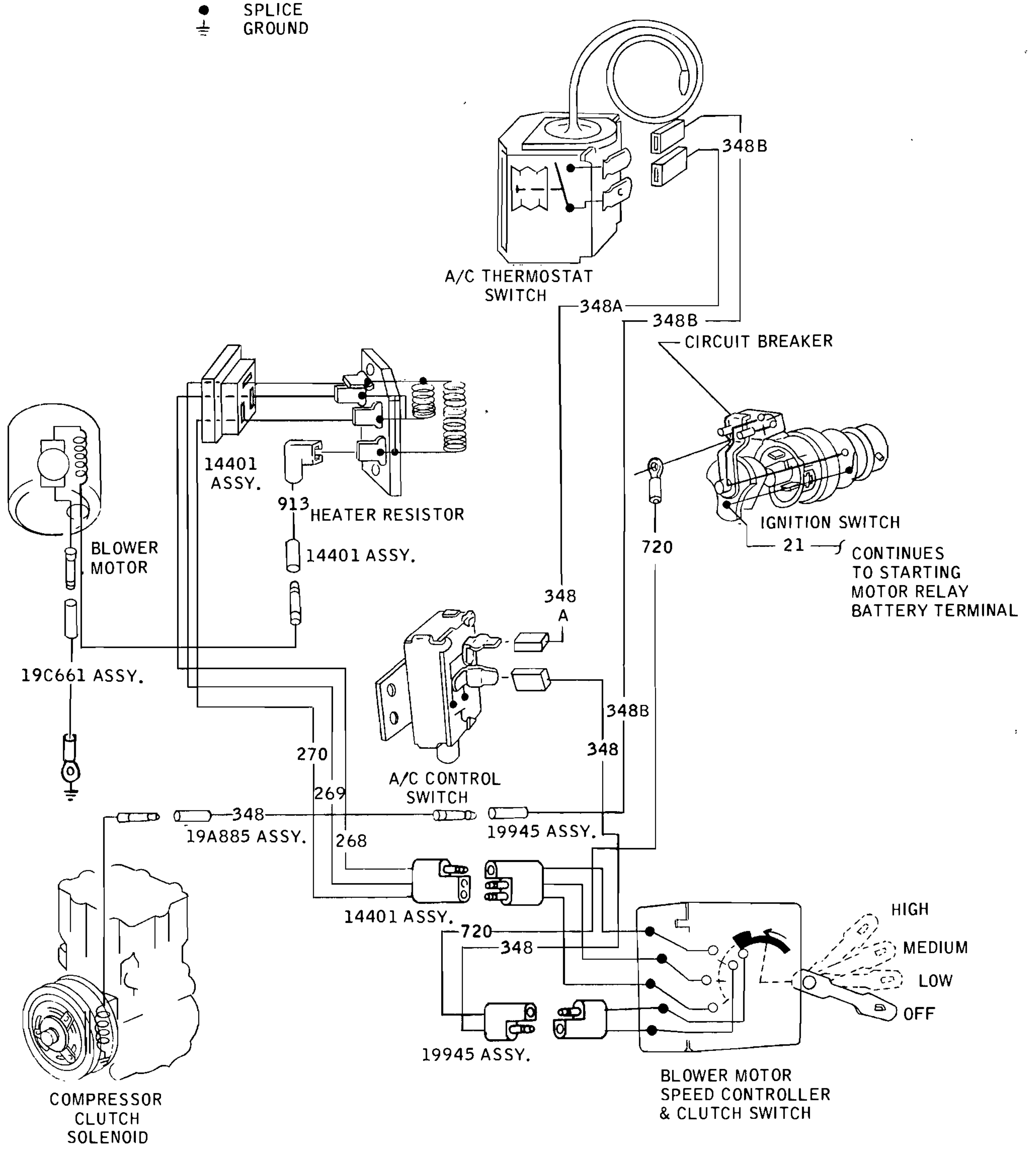
K 1776-B

FIG. 26—Cougar, Mustang Heater- Defroster


HEATER ASSY.
HEATER SWITCH FOR FAIRLANE & FALCON
HEATER SWITCH FOR COMET
FUSE PANEL
IGNITION SWITCH
HEATER BLOWER MOTOR
BLOWER MOTOR RESISTOR
HEATER BLOWER MOTOR
BLOWER MOTOR RESISTOR
14401 ASSY.
181
297A
269
268
913
297
IGNITION SWITCH
14401 ASSY.
HEATER SWITCH
FUSE PANEL
14 AMP. FUSE
57 (COMET)
57A
(FALCON-FAIRLANE)
WIRING COLOR CODE
57A 57 BLACK
181 ORANGE
268 RED
269 BLUE
297A 297 BLACK-GREEN STRIPE
913 YELLOW
K 1745-C

WIRING COLOR CODE

	720	VIOLET
21	913	YELLOW
	268	RED
	269	BLUE
	270	BLACK-YELLOW STRIPE
348B 348A	348	GREEN
	●	SPLICE
	⏚	GROUND



K 1777-B

FIG. 28— Cougar, Mustang Air Conditioner

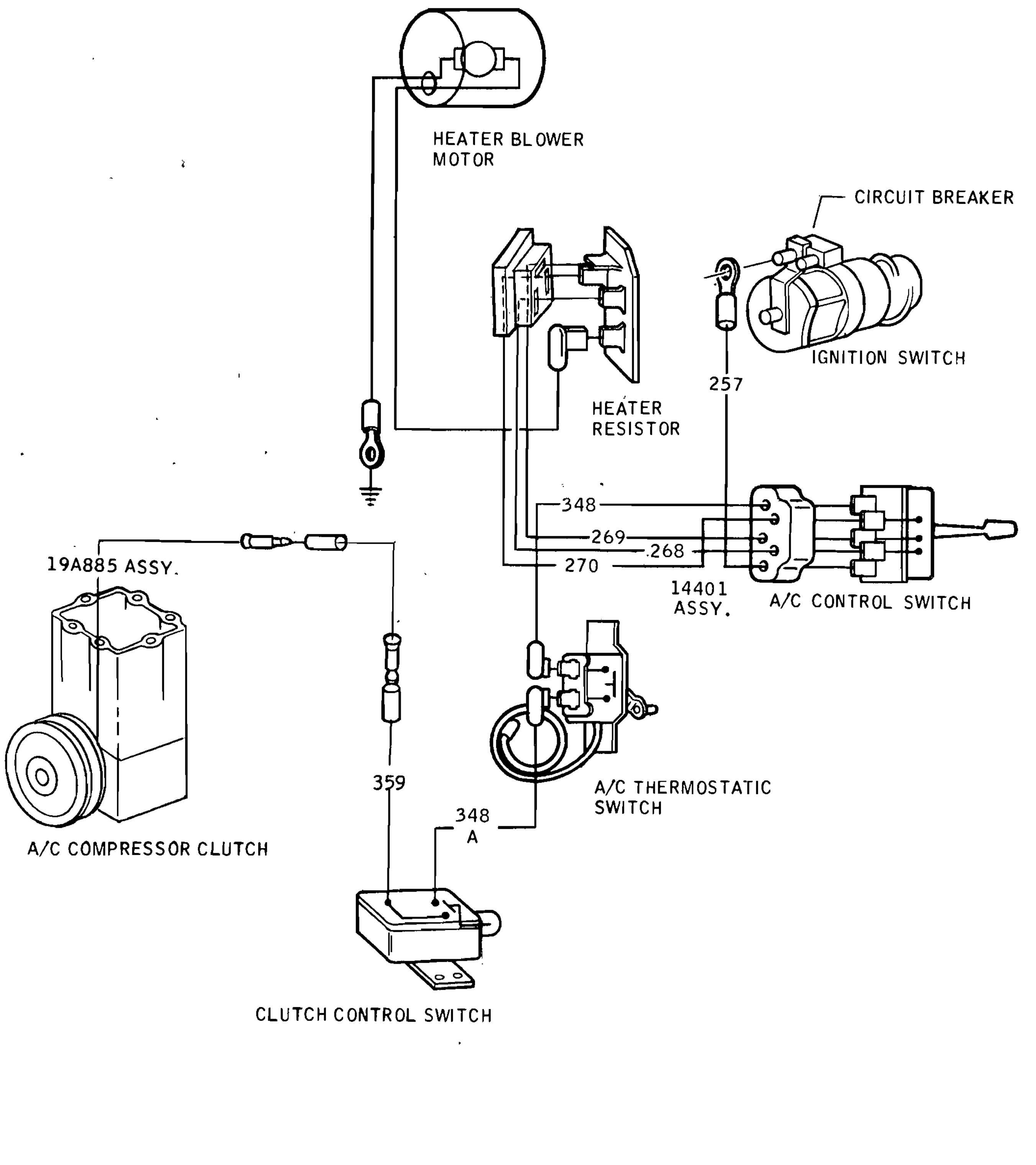


FIG. 29—Falcon, Fairlane, Mercury Intermediate Air Conditioner

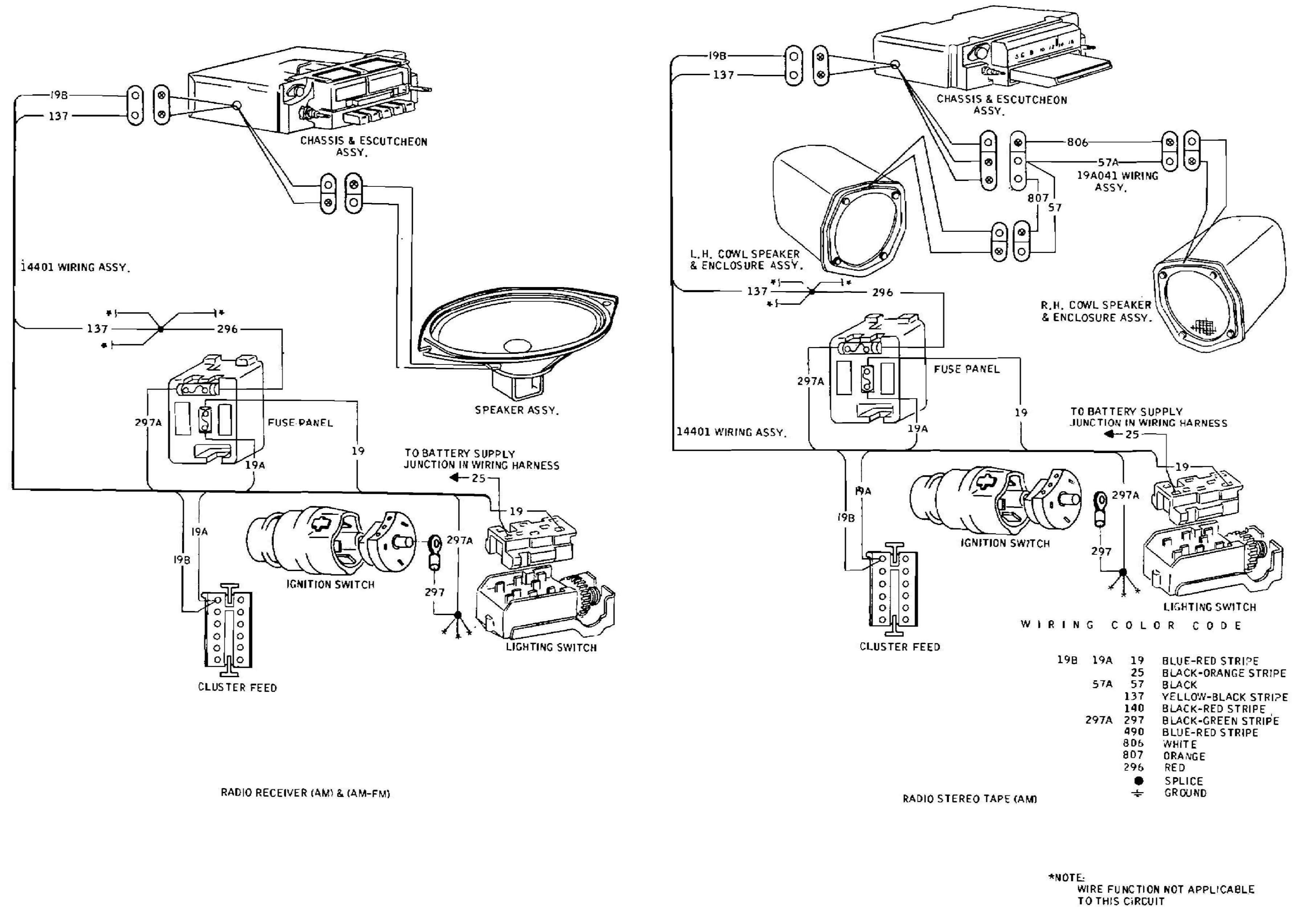
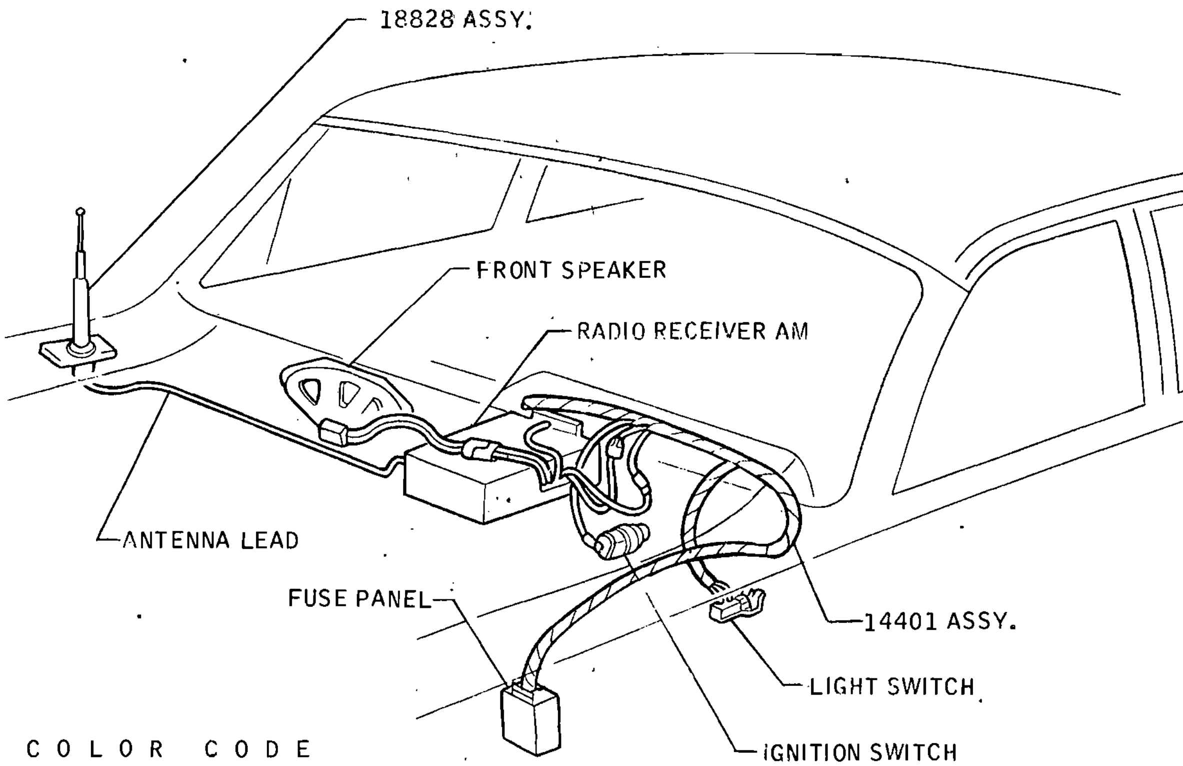


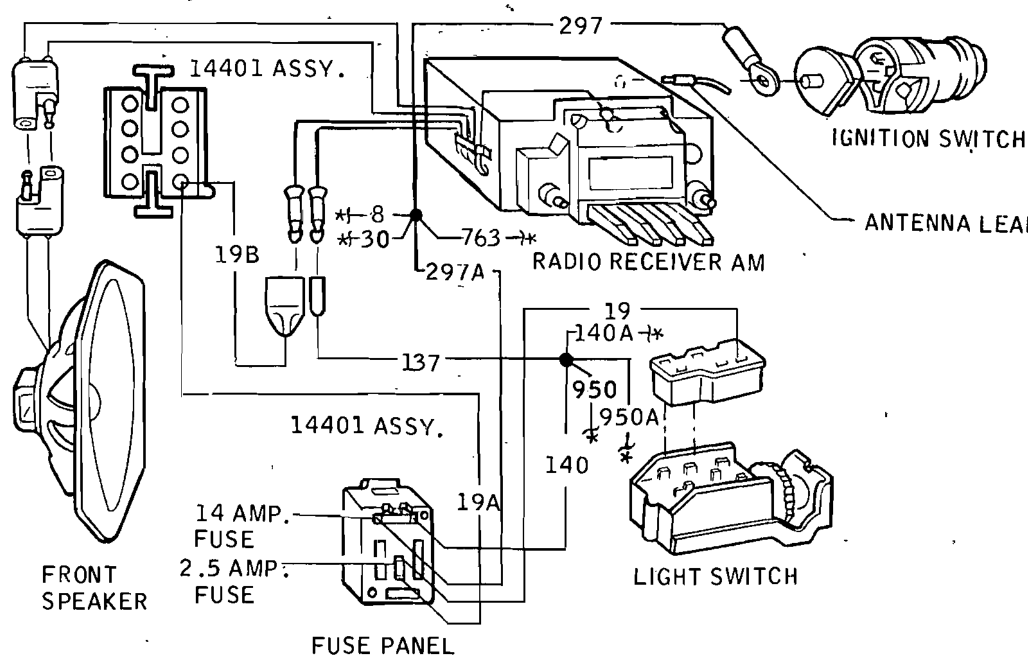
FIG. 30—Cougar Radio and Speakers AM and AM/FM and Stereo Tape Radio AM



WIRING COLOR CODE

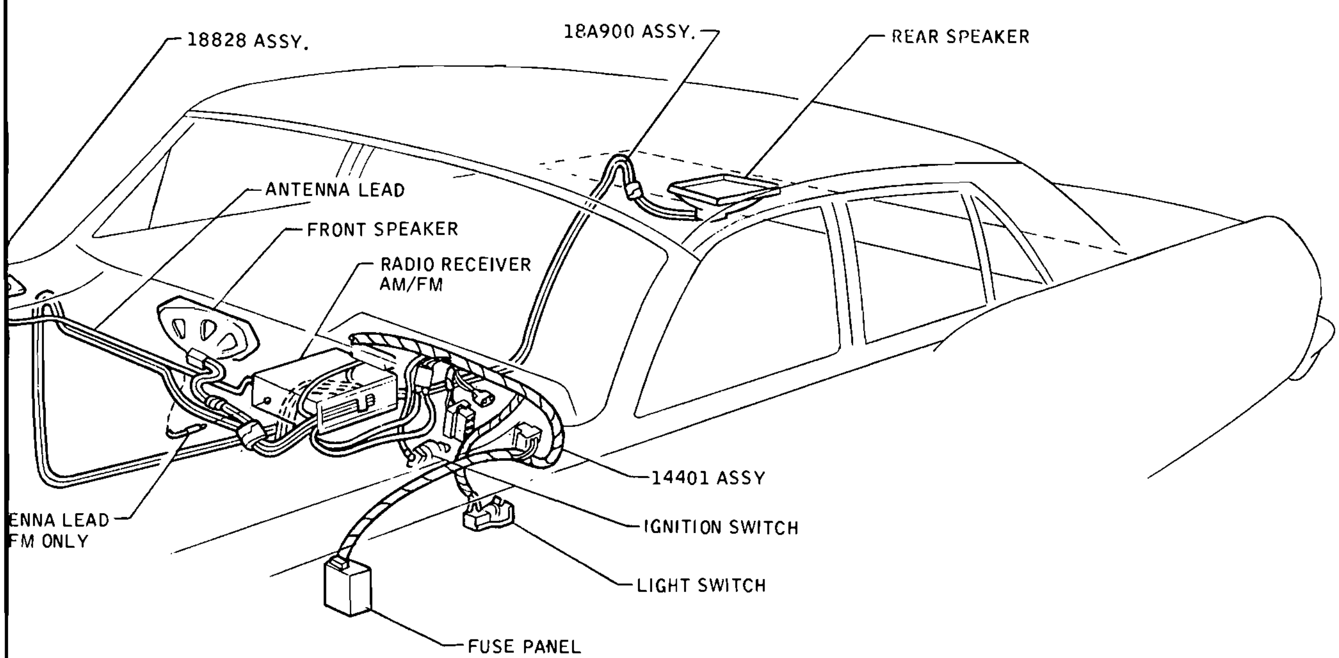
	137	YELLOW-BLACK STRIPE
19 THRU	19D	BLUE-RED STRIPE
	140	BLACK-RED STRIPE
297A	297	BLACK-GREEN STRIPE
		REPRESENTS (AM) CONNECTION
		SPLICE
		GROUND

FRONT SPEAKER WITH AM RADIO FOR FALCON & FAIRLANE ONLY



K 2209-A

FIG. 31—Falcon, Fairlane Radio and Speakers AM and AM/FM



REAR SPEAKER WITH AM & AM-FM RADIO
RECEIVER FOR MERCURY INTERMEDIATE ONLY

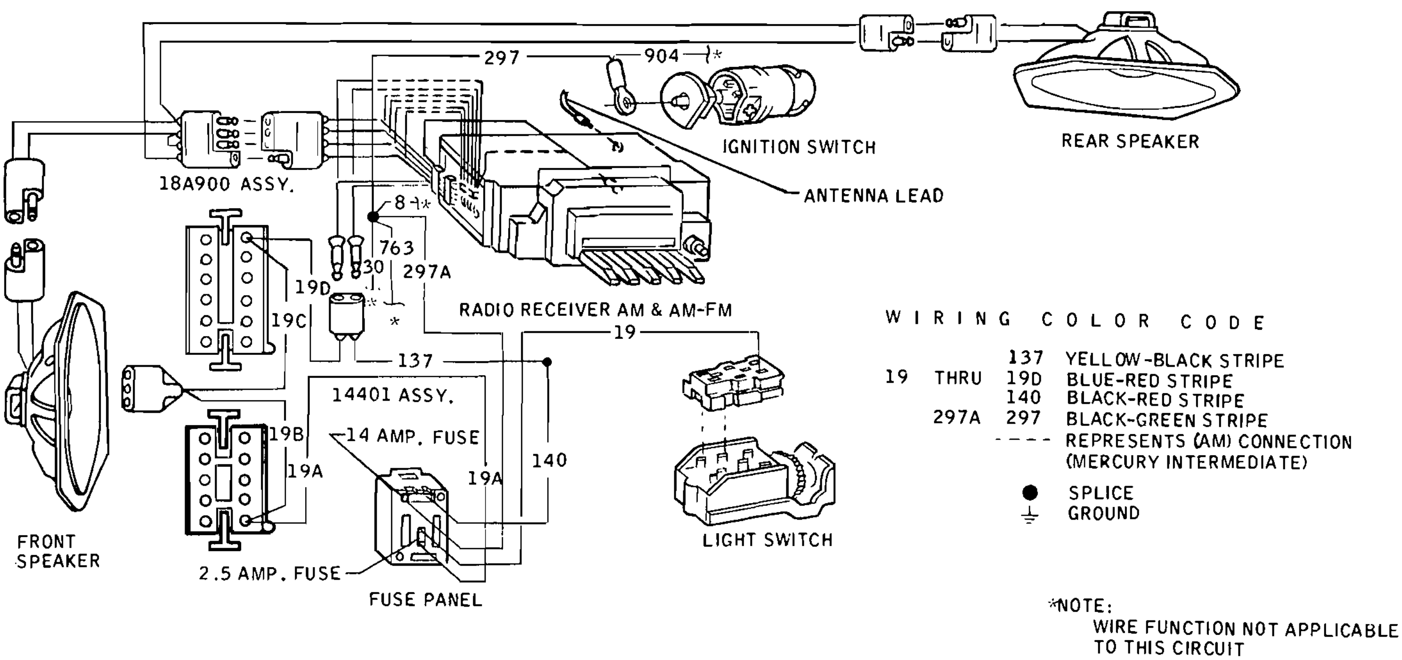


FIG. 32—Mercury Intermediate Radio and Speakers AM and AM/FM

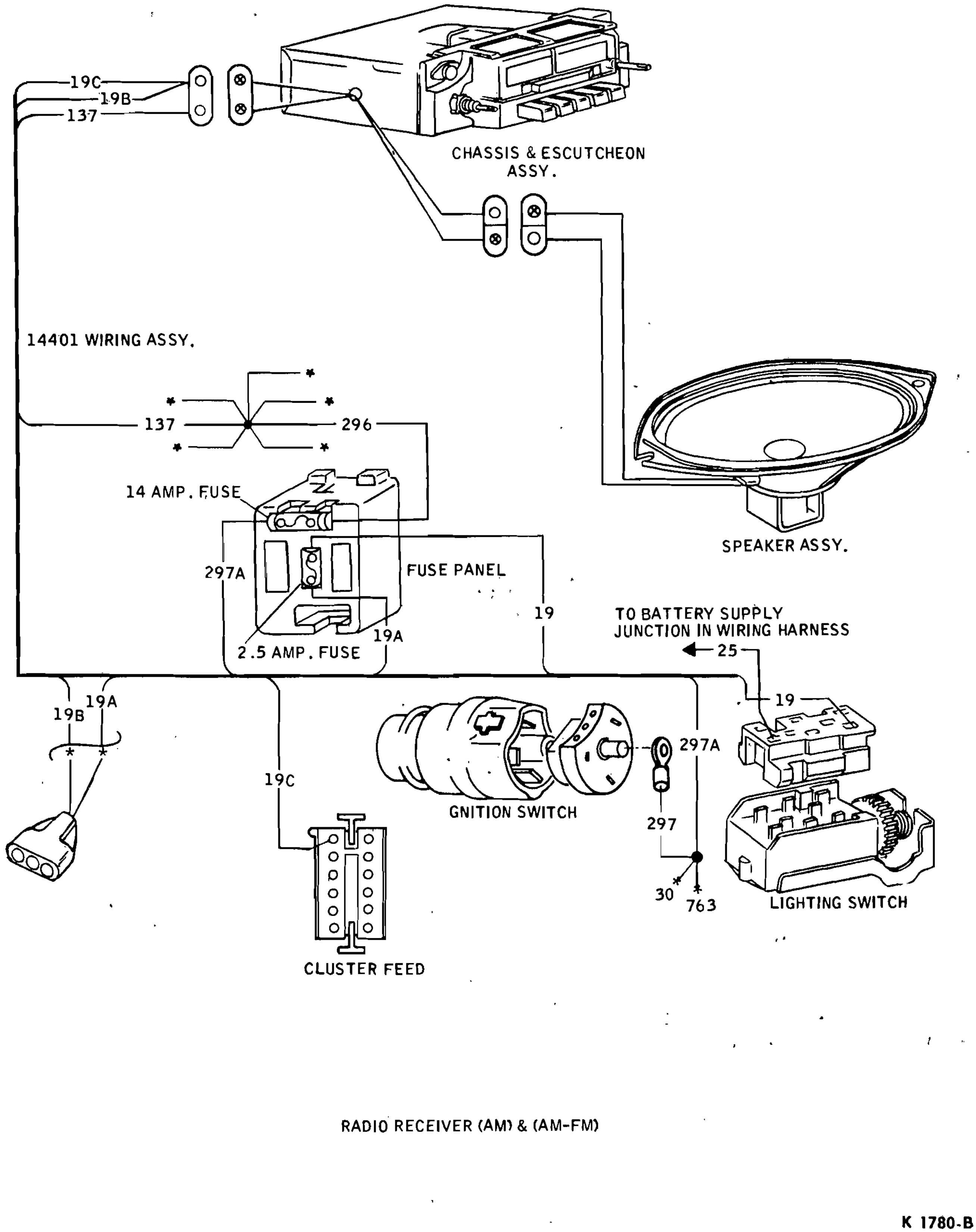
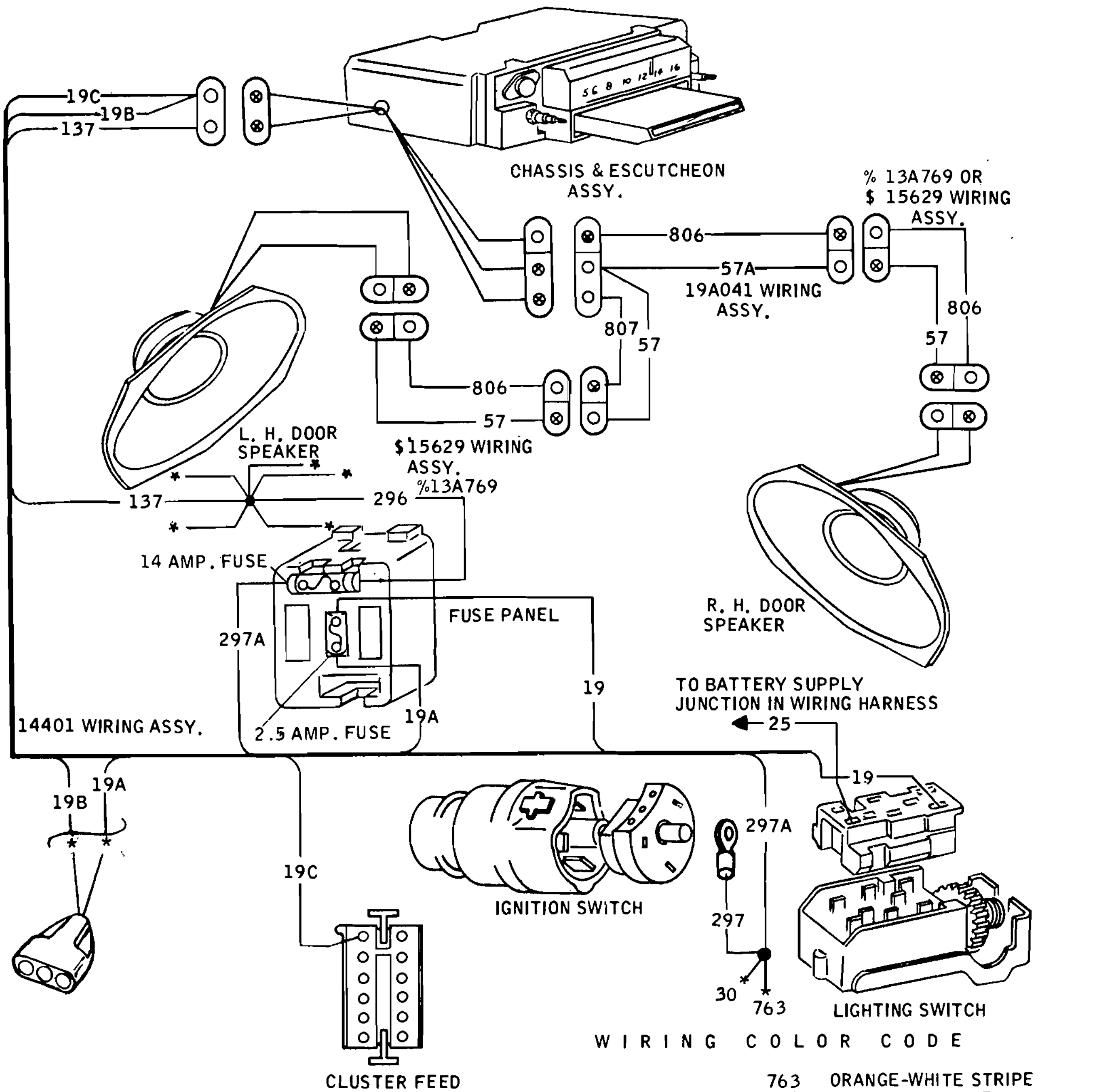


FIG. 33—Mustang Radio, Stereo and Speakers



WIRING COLOR CODE

	763	ORANGE-WHITE STRIPE
19C 19B 19A	19	BLUE-RED STRIPE
	25	BLACK-ORANGE STRIPE
57A	57	BLACK
	137	YELLOW-BLACK STRIPE
	296	RED
30 297A	297	BLACK-GREEN STRIPE
	490	BLUE-RED STRIPE
	806	WHITE
	807	ORANGE
	●	SPLICE
	$	STEREO ONLY
	%	STEREO & CONV. PKG. R. P.D.

RADIO STEREO TAPE (AM)

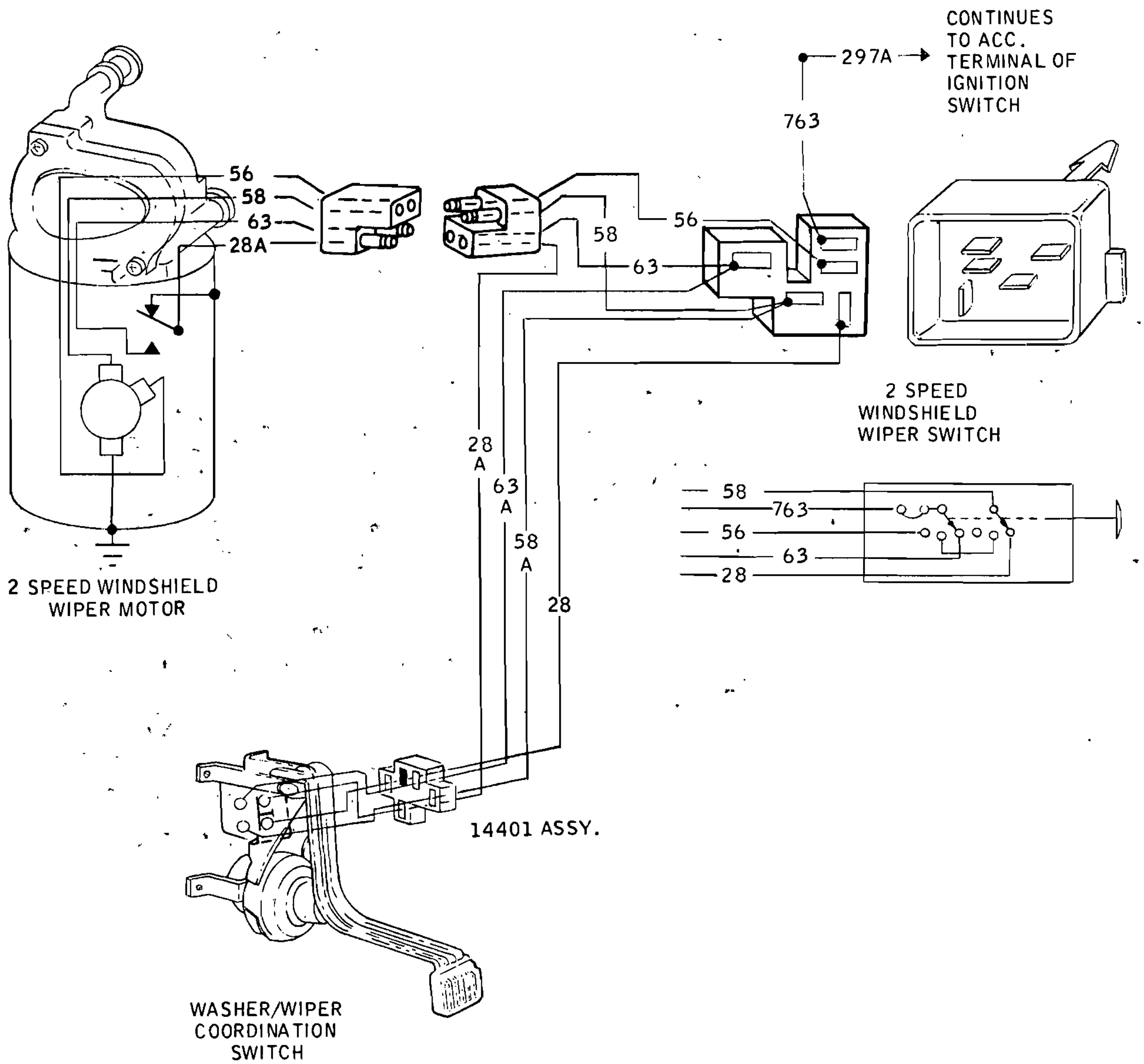
*NOTE:
WIRE FUNCTION NOT APPLICABLE TO THIS CIRCUIT

K 1780-B2

FIG. 33—Mustang Radio, Stereo and Speakers (Continued)

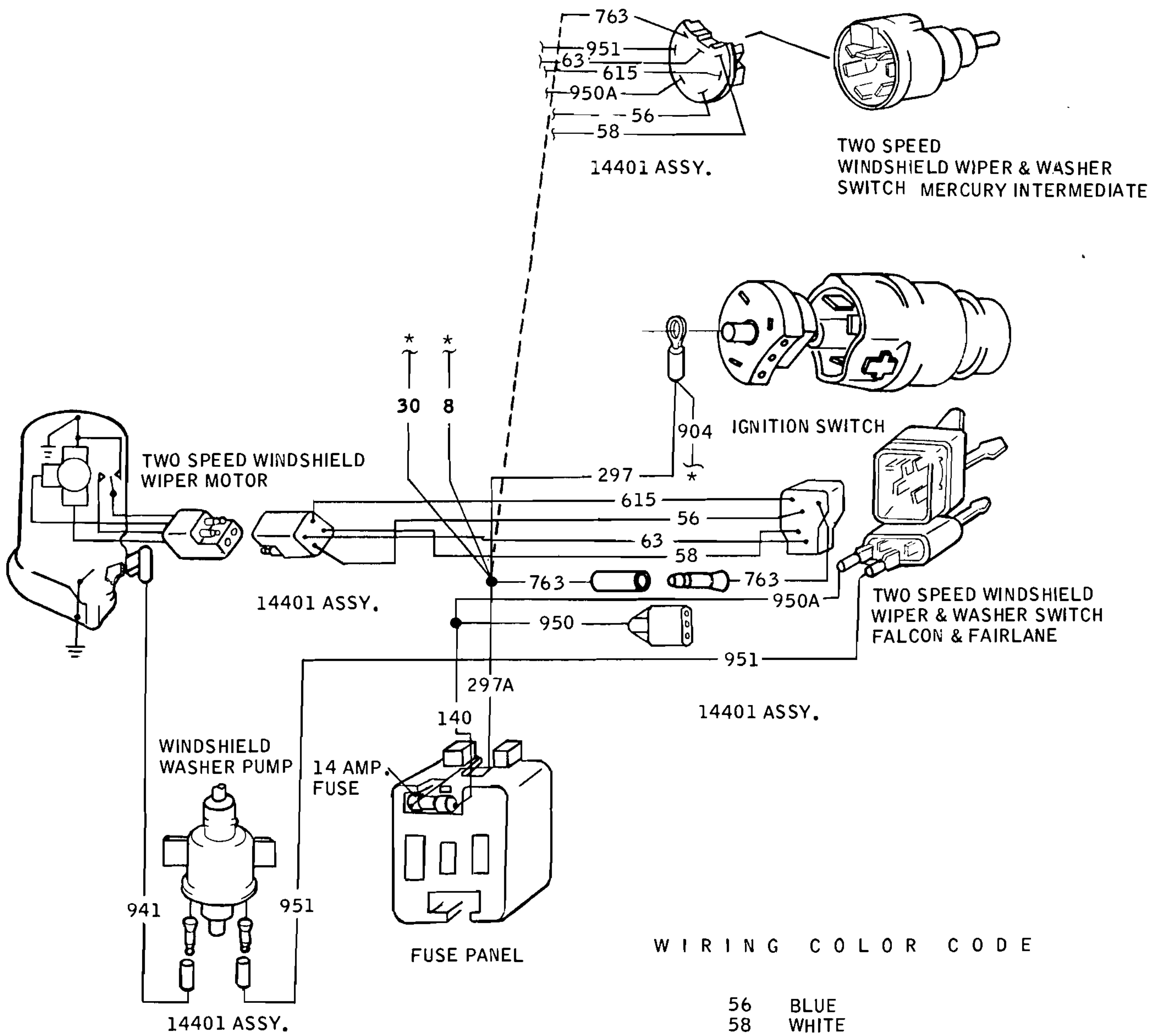
WIRING COLOR CODE

	56	BLUE
58A	58	WHITE
63A	63	RED
	297A	BLACK-GREEN STRIPE
28A	28	BLACK
	763	ORANGE-WHITE STRIPE
	●	SPLICE
	⏚	GROUND



K 1725-C

FIG. 34—Cougar, Mustang Windshield Wiper Washer

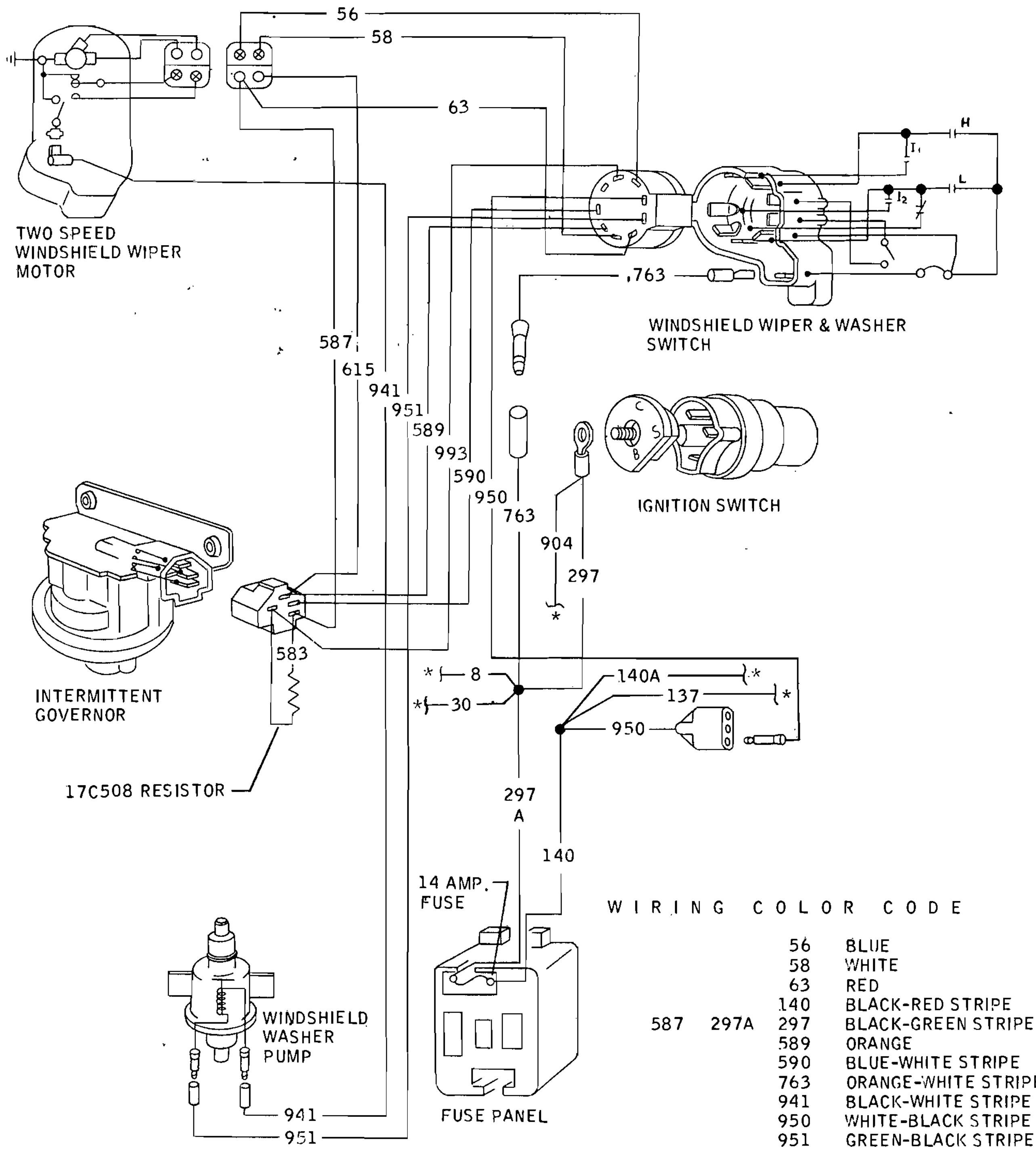


WIRING COLOR CODE

56	BLUE
58	WHITE
63	RED
140	BLACK-RED STRIPE
297A 297	BLACK-GREEN STRIPE
615	BLACK
763	ORANGE-WHITE STRIPE
941	BLACK-WHITE STRIPE
950 950A	WHITE-BLACK STRIPE
951	GREEN-BLACK STRIPE
•	SPLICE
- - -	MERCURY INTERMEDIATE ONLY
⏚	GROUND

K 2200-B

FIG. 35—Falcon, Fairlane, Mercury Intermediate Windshield Wiper Washer

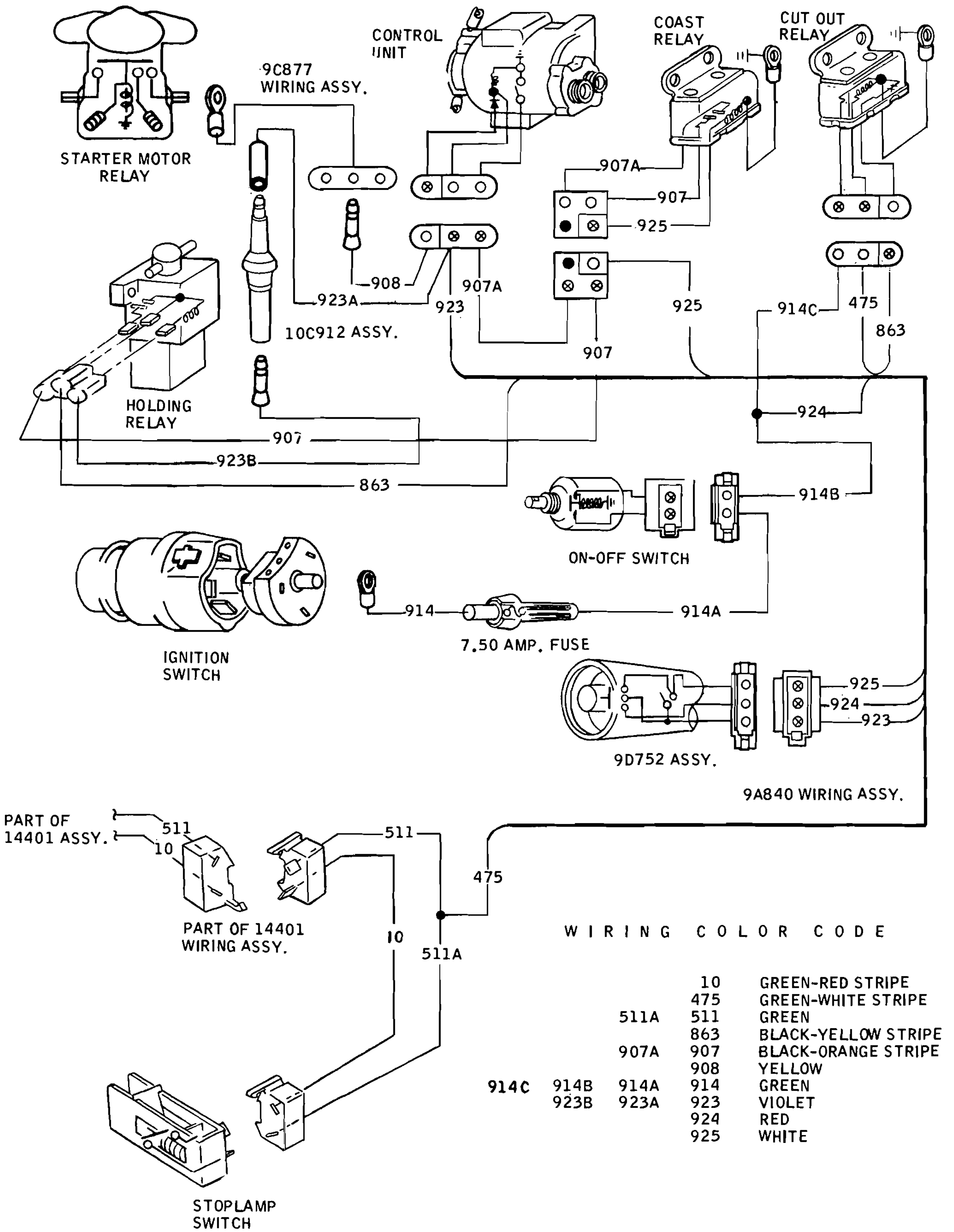


WIRING COLOR CODE

	56	BLUE
	58	WHITE
	63	RED
	140	BLACK-RED STRIPE
587 297A	297	BLACK-GREEN STRIPE
	589	ORANGE
	590	BLUE-WHITE STRIPE
	763	ORANGE-WHITE STRIPE
	941	BLACK-WHITE STRIPE
	950	WHITE-BLACK STRIPE
	951	GREEN-BLACK STRIPE
	993	BROWN-WHITE STRIPE
615	583	BLACK
	●	SPLICE
	⏚	GROUND

K 2211-

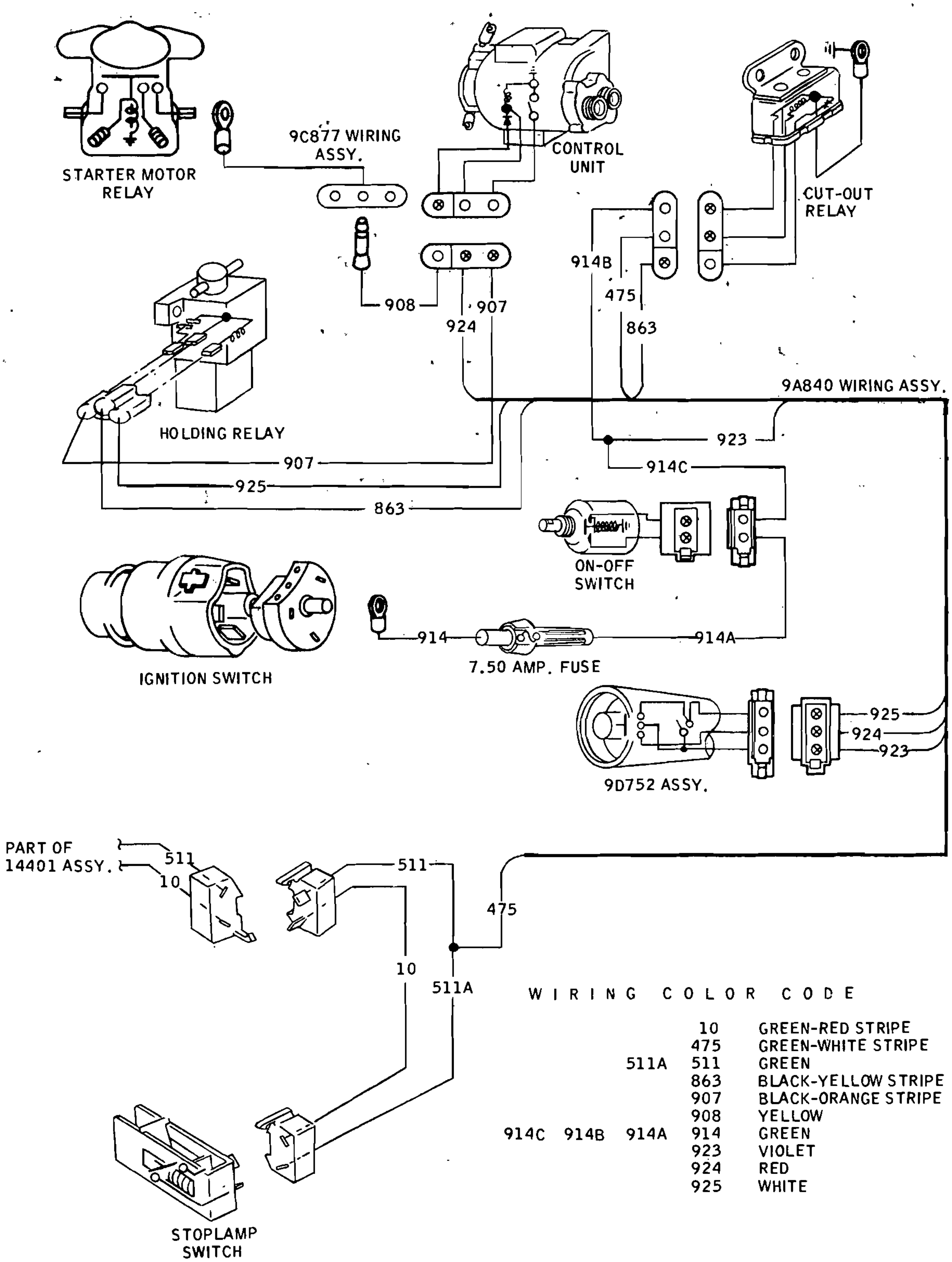
FIG. 36—Mercury Intermediate Intermittent Windshield Wiper Washer



WIRING COLOR CODE

			10	GREEN-RED STRIPE
			475	GREEN-WHITE STRIPE
		511A	511	GREEN
			863	BLACK-YELLOW STRIPE
		907A	907	BLACK-ORANGE STRIPE
			908	YELLOW
914C	914B	914A	914	GREEN
	923B	923A	923	VIOLET
			924	RED
			925	WHITE

FIG. 37—Cougar Speed Control — Curtiss-Wright

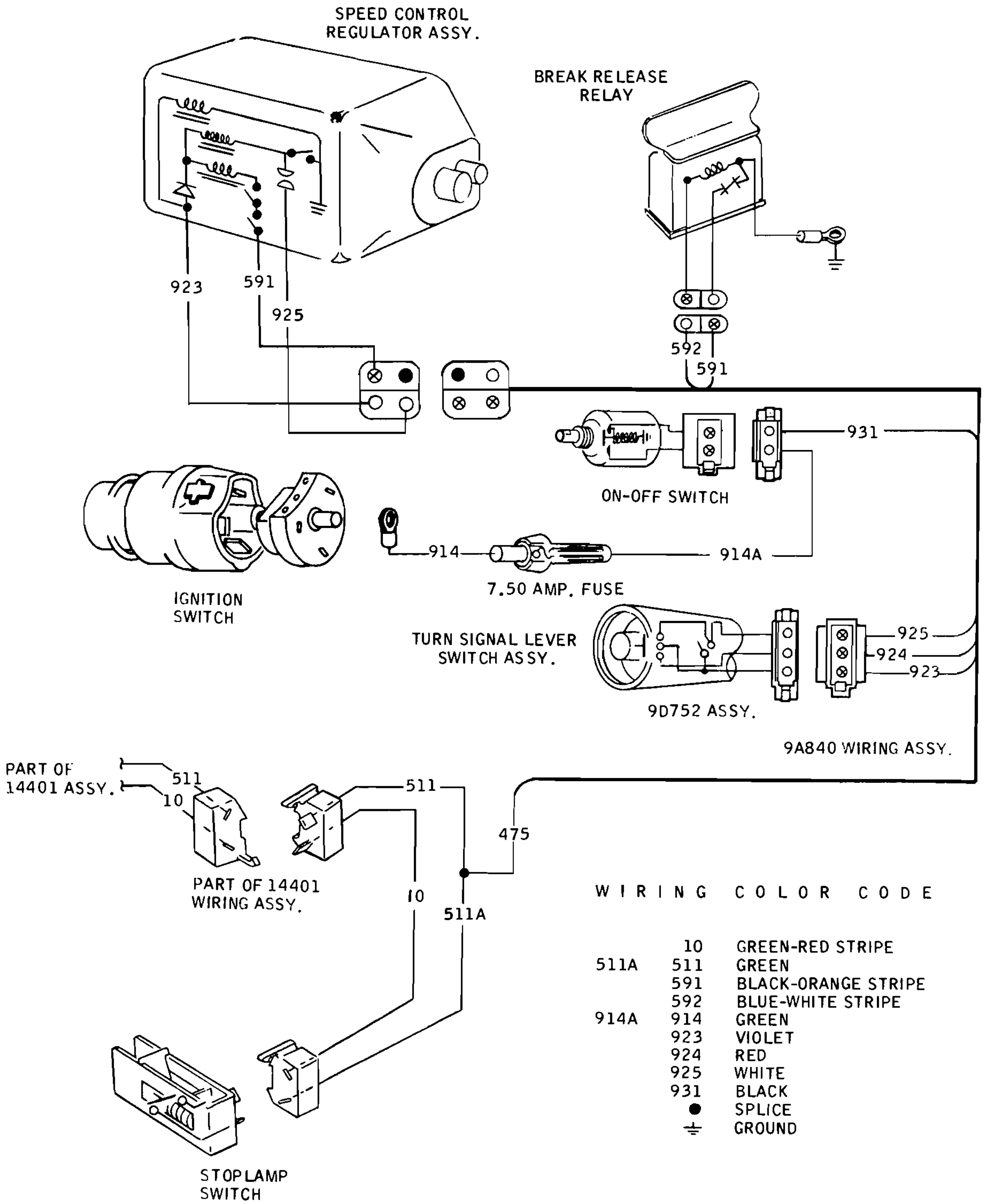


WIRING COLOR CODE

	10	GREEN-RED STRIPE
	475	GREEN-WHITE STRIPE
511A	511	GREEN
	863	BLACK-YELLOW STRIPE
	907	BLACK-ORANGE STRIPE
	908	YELLOW
914C 914B 914A	914	GREEN
	923	VIOLET
	924	RED
	925	WHITE

K 2234-A

FIG. 38—Mustang Speed Control — Curtiss-Wright



WIRING COLOR CODE

	10	GREEN-RED STRIPE
511A	511	GREEN
	591	BLACK-ORANGE STRIPE
	592	BLUE-WHITE STRIPE
914A	914	GREEN
	923	VIOLET
	924	RED
	925	WHITE
	931	BLACK
	●	SPLICE
	⏚	GROUND

K 2235-A

FIG. 39—Cougar Speed Control — Perfect Circle

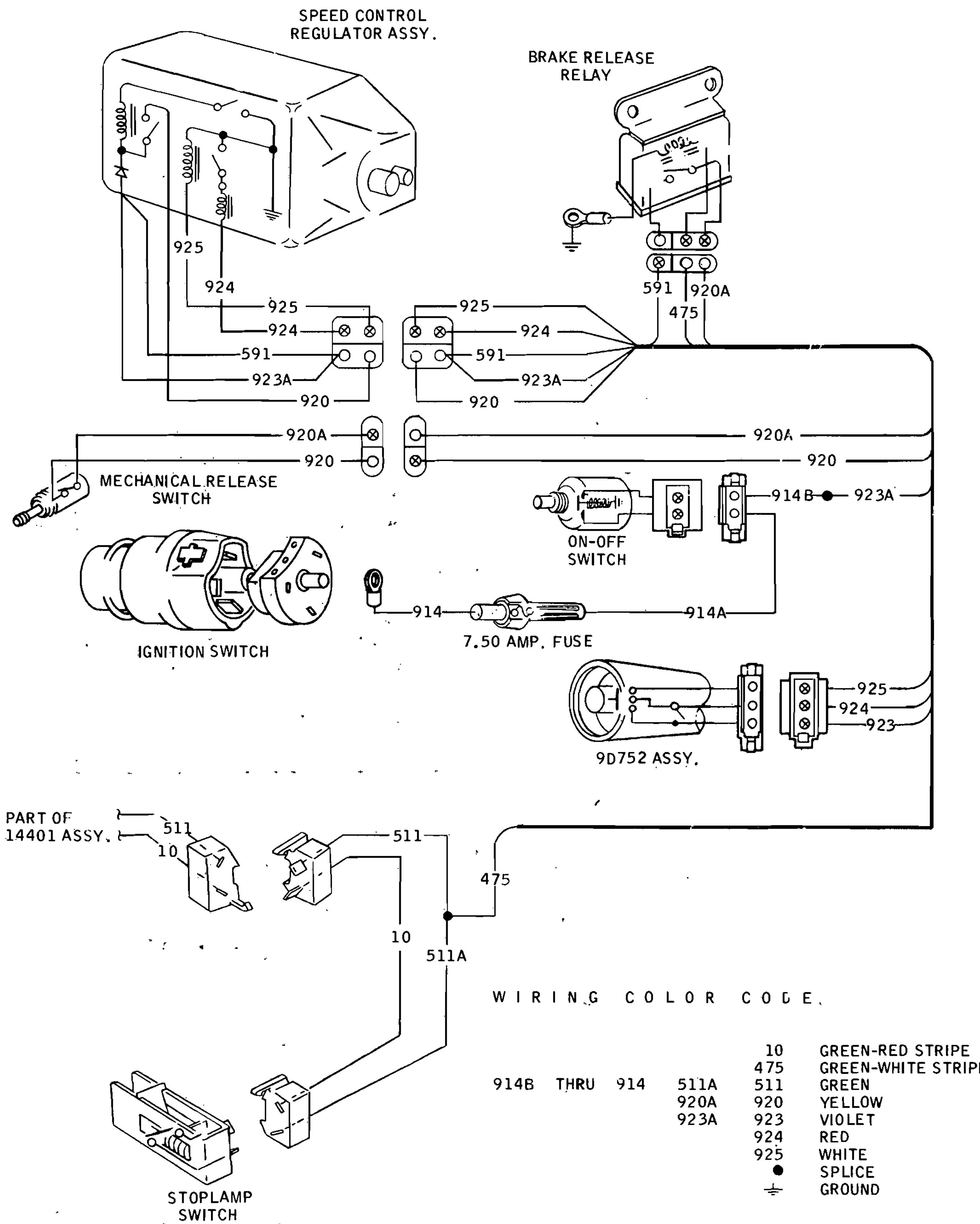


FIG. 41—Mustang Speed Control —Perfect Circle

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